



Preface

Dear user,

This operating manual provides the user of the Spierings folding crane with information concerning the crane's construction and operation. You will find detailed technical specifications and maintenance instructions in the maintenance part of this manual.

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Liability clause

SECTION 1. OPERATION

- 1.1 The Spierings truck may only be used for the purpose it was manufactured and designed for and only as described in the user manual or in the additions to it.
- 1.2 Any use of the Spierings truck that differs from its design purpose or as described in the use manual or the additions to it, will cause the product warranty and the manufacturer's liability, for any direct or indirect damage, to expire.
- 1.3 Only qualified, skilled personnel are allowed to operate the truck. The driver should have a special driving license for driving heavy vehicles. The driver/operator must be in good physical and mental health, so that he/she is able to carry out the work without restrictions and react with responsibility in all given situations.
- 1.4 The driver/operator/user of the Spierings truck should be informed immediately of any additions/changes to the user manual.

SECTION 2. SAFETY

- 2.1 For safety reasons the driver/operator/user should carry out all operations as stated in the user manual or in the additions to it.
- 2.2 If more stringent safety demands are locally placed on the truck/crane than specified in the Spierings truck user manual or additions to it, these more stringent requirements must be strictly complied with. If not, all warranty will expire and the manufacturer will not be liable for any damage or costs.
- 2.3 The Spierings truck manufacturer points out explicitly, that the driver/operator/user and local personnel should not enter the cranes/trucks danger zone. If, for any reason or cause, an unexpected situation occurs during operation one should contact the technical department or Spierings Service department first before proceeding.

SECTION 3. WARRANTY

- 3.1 It is prohibited to carry out modifications or welding to the Spierings truck without prior written permission of the manufacturer of the Spierings truck.
- 3.2 Frequent maintenance and periodic checks should be carried out in accordance with the user manual, or in the additions to it. If maintenance or checks are carried out otherwise, or less frequent, without prior written permission of the manufacturer of the Spierings truck, all warranty will expire and any liability, for direct or indirect damage, is explicitly excluded.



Explanation of the symbols used



CAUTION!



Wear safety goggles!



Wear safety gloves!



Wear safety boots!



Wear head protection!



Use safety belt!



Check!



Manual action!



Automatic action!



Wrong!



Right!



Information!



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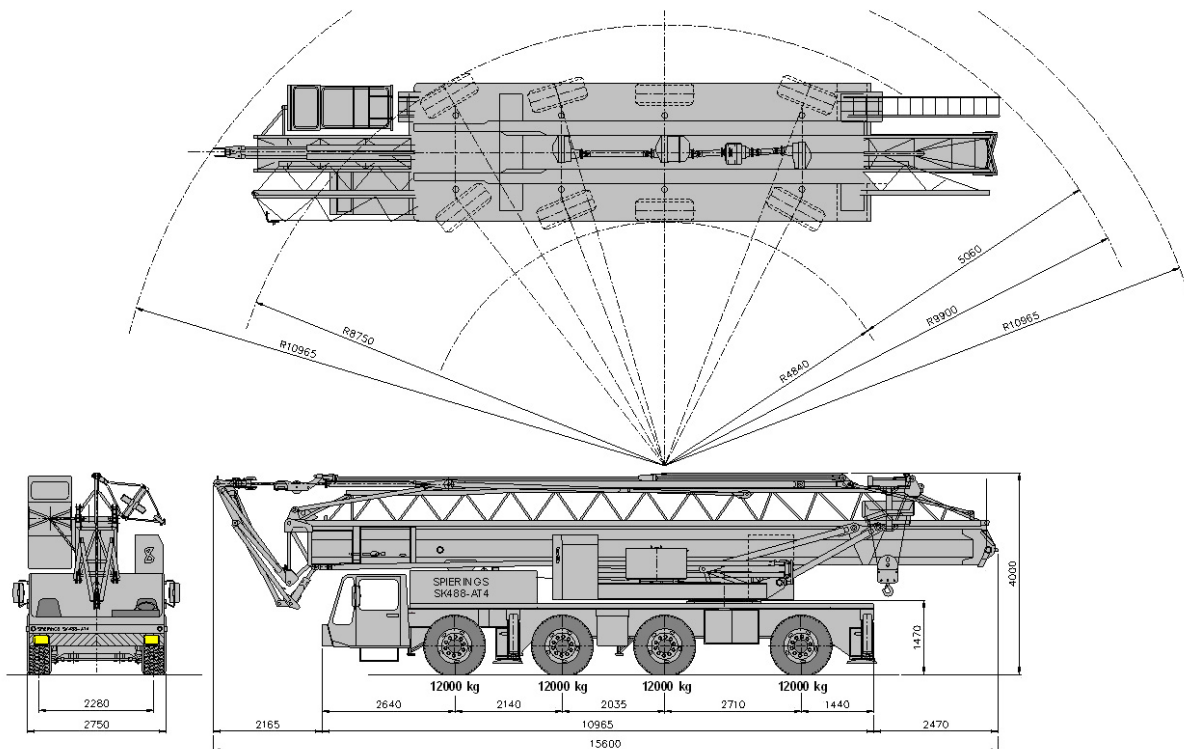


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1. General Data AT4

The AT4 carriage is especially designed for the Spierings SK488 folding crane. Extra attention is paid to a smooth and comfortable transport to the work site. The crane is suited for driving on public roads, fully equipped with counterweight and tools. The chassis is an especially rigid structure to create a good crane support.

In *Picture 1-1* you will find the measurements of the SK488 with the AT4 carriage. The dimensions given are the overall dimensions, axle bases and turning circle.



Picture 1-1

Measurements:

- Length: 15,8m
- Width: 2,8m
- Height: 4m

Drive unit:

- 12,6 litre DAF-diesel engine with turbo compressor and intercooler (type XE 315).
- ZF gearbox with sixteen gears forward and two gears reverse.
- STEYR high/low shift, transfer case, with high speed (road) and low speed (off the road) transmission.
- Electronic accelerator "E-gas" with speed control.
- Four Gmf axles, where axle two, three and four are driven.

**Steering:**

- Axle 1, 2 en 4 are steered.
- Mechanically coupled steering, where axle four is steered in the opposite direction of axle one and two, realizing a small turning circle.
- As option, axle 4 can be mechanically uncoupled and manually steered in the same steering direction as axle 1 and 2 using a joystick. When axle 3 is lifted, sideways driving is possible.
- Hydraulically powered steering system.
- Fitted with an emergency steering pump, so when the main steering pump malfunctions, the truck remains steer able until it is at a standstill.
- Provisions for driving off the road:
 - axle height adjustable
 - high/low gear shift transfer case can be put in low gear for driving off the road
 - longitudinal and transverse differentials can be locked

Suspension:

- Hydro-pneumatic suspension.
- The suspension can be blocked (e.g. when driving with erected tower.)

Braking system:

- Pneumatic brakes with anti-blocking system (ABS).

4-point outrigger system:

- wide support base = 6,9 m x 6,85 m
- Narrow support base = 6,9 m x 5,15 m

Further data:

- Maximum speed limit to 85 km/h
- Minimum speed at 1250 rpm: 1,9 km/h (is 32 m/min)
- Truck weight including superstructure: 48.000 kg
- De axle load is 12.000 kg per axle

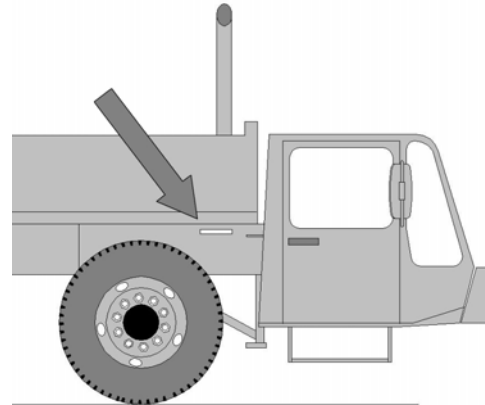


Identification:

- Engine number: Left-hand on the engine block above the fuel pump.
- Vehicle identification number: On the identification plate in the co-driver's leg-room (See *Picture 1-2*) and stamped in the right frame girder in front of the first axle. (*Picture 1-3*)



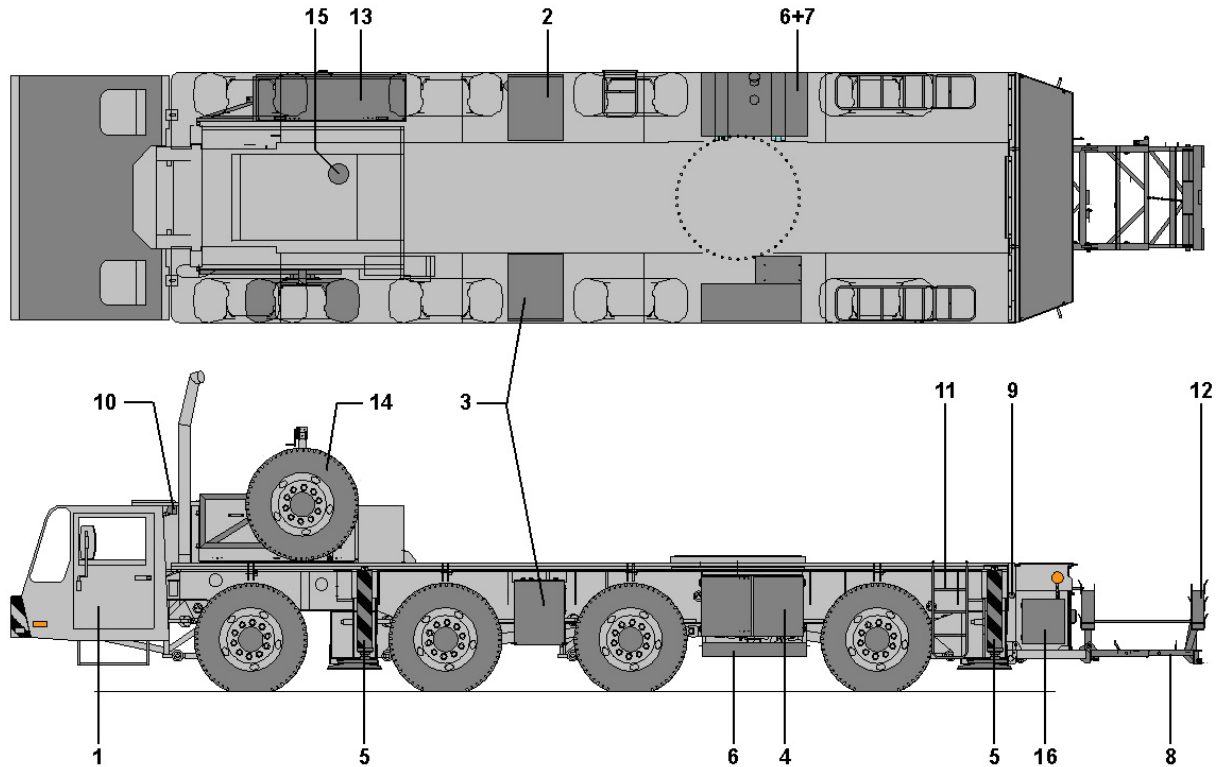
Picture 1-2



Picture 1-3

2. Operation

2.1. Get to know the truck



Picture 2-1

1. Truck cab

Besides driving the crane, with the controls in the truck cab you can support the crane on outriggers and adjust the carriage axle height.

2. Storage box/battery box/battery switch

In this storage box, the batteries are placed. To the right side of this box, you'll find the battery switch.

3. Hydraulic oil tank

On this side of the truck you will find the hydraulic oil tank.

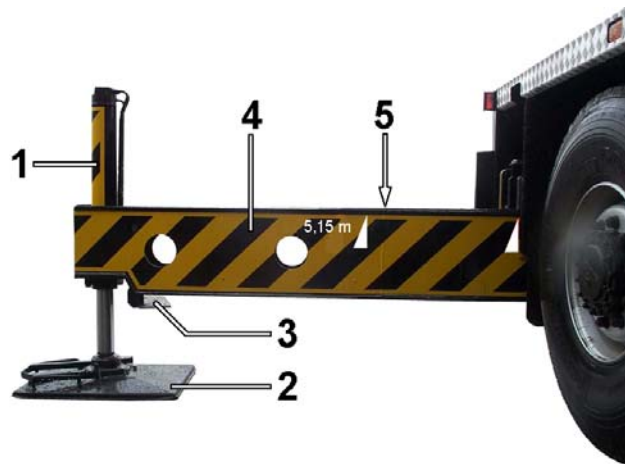
4. Storage box

This box is lockable and can be used for hoisting equipment.

5. Outriggers

At both sides of the truck there are 2 extending outrigger beams (Picture 2-2, 4), and to each beam a hydraulically operated outrigger (1). These outriggers provide stability during hoisting operation. The outrigger beams have an antiskid coating (5) to prevent skidding. The outrigger pad holders (3) can be used to facilitate stepping on the outrigger beam (2).

With a separate (remote) control box the outriggers can be radio controlled. On the rear outrigger beams are levels to check if the crane set-up is level.



Picture 2-2

6. Storage room support plates

To obtain a solid support base on a weak ground, support plates can be used. Under the toolbox as well as under the fuel tank there are 2 support plates each.

7. Fuel tank

The fuel tank capacity is 400 liters.

8. Bumper

The crane has a standard bumper at the rear. When the bumper is folded up, the towing hook can be used.

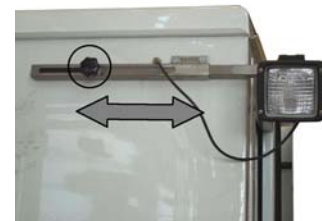
9. Jib turning pipe

Through a hole in the deck you can reach the jib turning pipe. This pipe is used to swing the jib in front of the tower during erecting and folding the crane.

10. Work lamps

To the rear of the cab and truck are mounted work lamps, which can be switched on/off from the cab.

By unscrewing the knob, the lamp support can be moved to the left and right (see Picture 2-3).



Picture 2-3

11. Truck ladders

To facilitate getting on the truck, three ladders are mounted. Pick up the free end of the ladder so the pin comes out of the deck (see Picture 2-4) and swing the ladder outside the frame. When swinging back the ladder, make sure the pin returns in the hole.



Picture 2-4

12. Concrete bucket/brick gripper support (optional)

On the bumper a support can be mounted to carry a concrete bucket or a brick gripper.

**13. Sling box**

On this location you can install a sling box to store your chains and slings. The sling box can be turned aside so the engine housing remains accessible.

14. Spare tire/Sling box/pallet hook support/Hullo clamp support (optional)

On this location you can install one of the following options

Spare tire support. The spare tire support is fitted with a winch and is mounted on a swing frame. When you swing the frame out you can lower the spare tire with the winch.

- Sling box
- Pallet hook support
- Hullo clamp support

All these options can be turned aside so the engine housing remains accessible.

15. Central lubrication system (optional)

This is the grease reservoir for the truck's optional central lubrication system.

16. Toolbox at the rear (optional)

For extra storage room a toolbox can be mounted all along the rear of the truck.

17. Rear- and side view cameras (optional)

To broaden your view at the rear and right-hand side of the truck cameras can be installed. In the cab a monitor is installed, showing the camera view.

Standard, the view of the side camera is shown. When putting the transmission in reverse, the monitor automatically switches over to rear camera view.

2.2. Truck cab

In the truck cab you drive the crane safely and comfortably to its destination. This chapter makes you familiar with the cab.

2.2.1. Getting in

Use the step under the door. Make use of the steering wheel to hold on to.

2.2.2. Doors

Turn the handle up to open the door from the inside. The door can only be locked up from the outside.

There is an ashtray on the inside of the door. After opening the ashtray, you push the locking device down to remove the ashtray from the holder to empty it.

Use the switches on the dashboard to operate the door windows electronically.

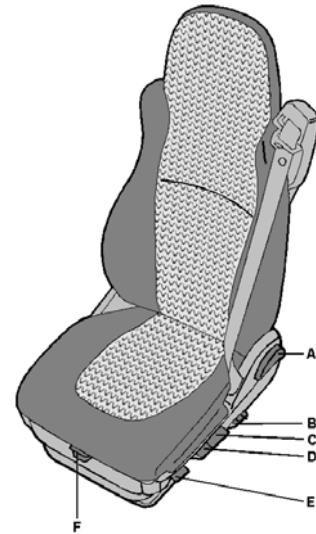
2.2.3. Wing mirrors

The wing mirrors may be adjusted by hand. Make sure the mirrors are adjusted before driving off, so that you have satisfactory view. The mirror heating can be switched on with the switch on the control panel.

2.2.4. Seats

The cab has room for the driver and a co-driver. The driver's seat has pneumatic suspension. The seats' position can be adjusted. This should only be done when the vehicle stands still.

- A) Back adjustment
- B) Lumbar support adjustment (push = pumping up an pull = deflating)
- C) Height adjustment (pulling the handle = up and pushing it = down)
- D) Tipping the seat
- E) Handle fast lowering
- F) Adjustme nt seat



Picture 2-5

2.2.5. Safet y belts

The seats are fitted with safety belts. Driver and co-driver must wear them when driving. Do not modify the belt or its attachment by yourself. Regularly check its operation by jerking the belt from its winding mechanism. The belt must lock when doing this. Have the locking device repaired or replaced when it does not function properly. When the belt was heavily loaded during a collision, it must be completely replaced, even if it looks like there is nothing wrong with it.

2.2.6. Sto rage room

In the middle of the cab ceiling is a storage compartment. It has a lockable lid at the driver's side and at the side of the co-driver. There is another storage compartment at the co-driver's side in the dashboard. (Picture 2-6, A)

2.2.7. Su n blind

To prevent sunlight from blinding you, a sun blind is mounted above the windscreen for the driver and the co-driver. Pull down the blind with the joggle in the middle of the blind. The blind will remain in the desired position. Push the button on the side of the blind to roll it up

2.2.8. F use box

The fuse box is at the co-driver's side in the centre console (Picture 2-6, B). You will find the fuses listed in the enclosures.

2.2.9. Windscreen washer reservoir

(Picture 2-6, C)

2.2.10. Central lubrication system (optional)

The central lubricating system controls are on the centre panel at the co-driver's side. It can be opened by means of 2 clamps (*Picture 2-6, B*).



Picture 2-6

2.2.11. Battery charger remote control batteries

You will find the battery charger for the remote controls on the left under the dashboard at the driver's side (*Picture 2-6, D*).

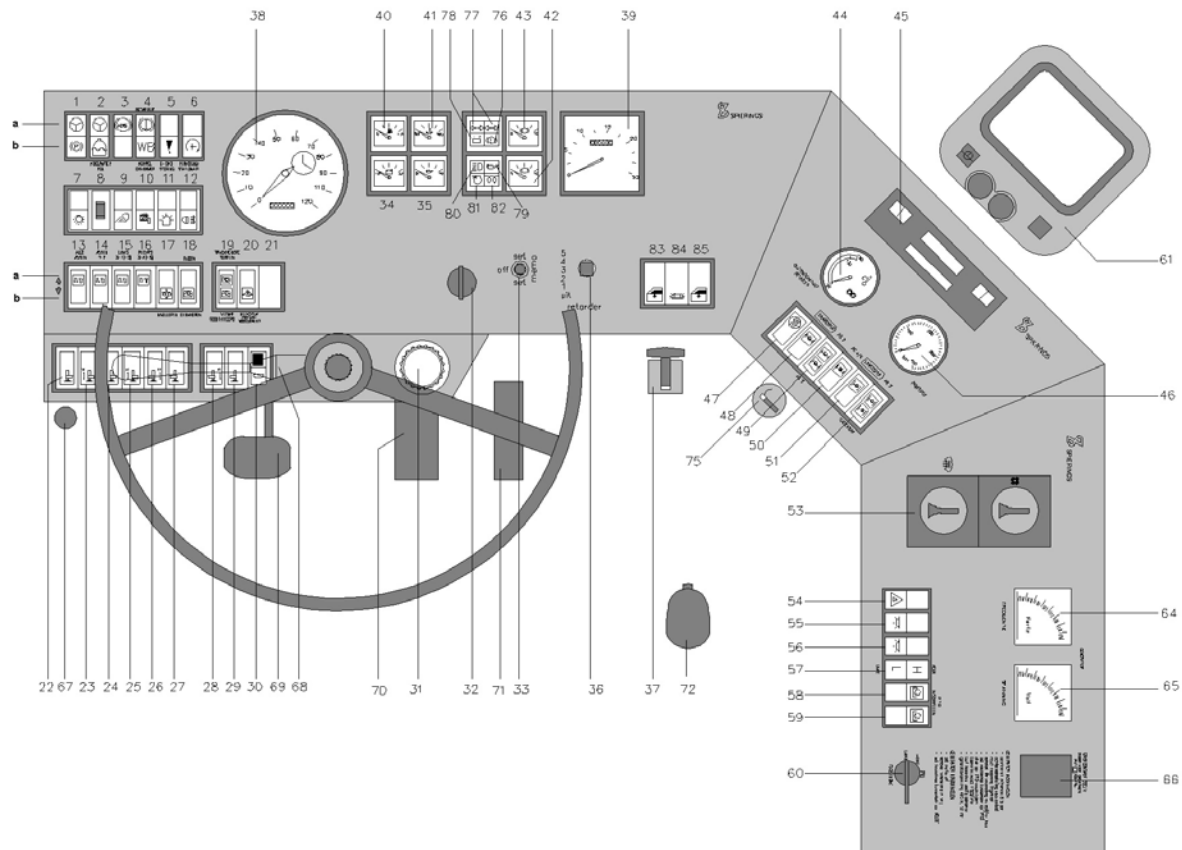
Every remote control comes with 2 batteries each. While the batteries are charged, the indicator lamp lights up. As soon as they are fully charged, the lamp starts flashing.

2.2.12. Fire extinguisher

One fire extinguisher is behind the co-driver's seat. On the right behind the control box in the crane cab is the second fire extinguisher.

The fire extinguishers must be inspected every year by the authorities

2.3. Control panel



Picture 2-7

- | | | |
|--|--|---|
| 1a Indicator lamp steering pressure circuit | 27 Switch outrigger beam front right-hand side retract/extend | 54 Switch alarm light |
| 1b Indicator lamp parking brake | 28 Switch outrigger rear right-hand side retract/extend | 55 Switch cab lighting on the left |
| 2a Indicator lamp steering pressure circuit 2 | 29 Switch outrigger beam rear right-hand side retract/extend | 56 Switch cab lighting on the right |
| 2b Indicator lamp coolant level | 30 Switch outrigger controls on/off | 57 Indicator lamp high/low gear shift |
| 3 Sw Itch/Indicator lamp ABS | 31 R eservoir clutch fluid | 58 Indicator lamp transfer case neutral |
| 4a Indicator lamp retarder on (optional) | 32 Ig nition lock | 59 Switch transfer case neutral |
| 4b Not in use | 33 Spee d control | 60 Switch position transfer case high/low/neutral |
| 5a ESC malfunction diagnosis lamp | 34 Vol tmeter batteries | 61 Monitor reverse-side camera (optional) |
| 5b Indicator lamp sensor intermediate position | 35 Oil-pressure gauge (lubrication circuit) | 62 Gr ound switch |
| 6 Not in use | 36 Switch retarder control | 64 Not in use |
| 7 Light switch, off/parking light/dipped beam | 37 Lever parking brake | 65 Not in use |
| 8 D immer dashboard lighting | 38 Tachograph, speedometer, mileage counter, clock | 66 Not in use |
| 9 S witch work lamps | 39 Revolution counter, hour counter | 67 Vacuum brake/engine stop |
| 10 Switch mirror heating | 40 Fuel gauge | 68 Switch for blinker, windscreen wiper, horn, signal, full beam headlamp |
| 11 Switch rotating beacon | 41 Coolant temperature gauge | 69 C lutch pedal |
| 12 Switch fog tail-light | 42 Air-pressure gauge circuit 2 | 70 Br ake pedal |
| 13 Switch alls axles up/down | 43 Air-pressure gauge circuit 1 | 71 A ccelerator pedal |
| 14 Switch axles 1 and 2 up/down | 44 Oil temperature gauge retarder (optional) | 72 Lever range selector with splitter |
| 15 Switch axle 3 and 4 left-hand side up/down | 45 R adio | 75 C igarette lighter/24V-connection |
| 16 Switch axle 3 and 4 right-hand side up/down | 46 Gauge pump pressure steering system | 76 Indicator lamp charging voltage batteries |
| 17 Switch/indicator lamp levelling | 47 Indicator lamp oil temperature WSK (optional) | 77 Indi cator lamp blinker |
| 18 Sw itch driving/blocking | 48 Switch/indicator lamp transverse differential lock axle 2,3 and 4 | 78 I ndicator lamp air-pressure |
| 19a Indicator lamp off the road mode | 49 Indicator lamp transverse differential lock axle 2 and 3 | 79 Indicator lamp full beam headlight |
| 19b Indi cator lamp blocking | 50 Indicator lamp transverse differential lock axle 4 | 80 Indicator lamp oil pressure (transmission oil) |
| 20 Indicator lamp max. pressure outrigger-/suspension system | 51 Switch/indicator lamp longitudinal differential lock | 81 Indicator lamp air cleaner |
| 21 Not in use | 52 Indicator lamp longitudinal differential lock | 82 Indicator lamp flame starting system |
| 22 Switch outrigger beam front left-hand side retract/extend | 53 C ontrol heater/fan | 83 Control electrical window (left-hand) |
| 23 Switch outrigger front left-hand side retract/extend | | 84 Switch aeronautical warning light on jib and tower (optional) |
| 24 Switch outrigger beam rear left-hand side retract/extend | | 85 Control electrical window (right-hand) |
| 25 Switch outrigger rear left-hand side retract/extend | | |
| 26 Switch outrigger front right-hand side retract/extend | | |



1a. Indicator lamp steering pressure circuit 1

This Lamp lights up as soon as the oil pressure in steering circuit 1 is too low. Have the malfunction repaired as soon as possible. If this lamp lights together with lamp 2a: STOP IMMEDIATELY!



1b. Indicator lamp parking brake

As long as the parking brake is engaged, this lamp is on (when starting the engine the parking brake remains engaged as long as the air-pressure is below 5.5 bar (80 PSI).



2a. Indicator lamp steering pressure circuit 2

This lamp lights up as soon as the oil pressure in steering circuit 2 is too low. Have the malfunction repaired as soon as possible. If this lamp lights together with lamp 1a: STOP IMMEDIATELY! When the vehicle stands still, this lamp will light.



2b. Indicator lamp coolant level

This lamp lights up as soon as the coolant level is too low. Replenish coolant.



3. Indicator lamp/switch ABS

This lamp is on when operating the ignition and remains on until a driving speed of 7 km/h (4.4 mph) is reached. From 7 km/h (4.4 mph) it goes out and will only light up in case of a malfunction. At first, push and release the switch to reset the system. If this doesn't resolve the problem, have the malfunction repaired as soon as possible.



5a. E-gas diagnosis lamp

Indicator lamp flashers: Stop the vehicle and switch off the engine to prevent damage on the vehicle and/or engine.

Indicator lamp lights up: There is a malfunction. Some functions will not work correctly. You can drive the vehicle but repair the problem as soon as possible.



7. Light switch

By pressing this switch halfway, the parking lights are switched on. By pressing the switch all the way, the dipped beams are switched on.



8. Dimmer dashboard lighting

When switching on the vehicle lighting also the dashboard lighting goes on. With this dimmer you can change the dashboard lighting intensity.



9. Work Lamps

At the rear of the cab and truck are 2 work lamps each. With this switch the 4 work lamps are switched on and off.



10. Mirror heating

With this switch the mirror heating in the left and right wing mirror is switched on and off.



11. Rotating beacon

With this switch the rotating beacon can be switched on and off.



12. Fog tail-light

With this switch the fog tail-light on the cab can be switched on and off.

**ALL
AXLES**

13. Switch for all axles up/down

With this switch the cylinders of all axles are moved in and out simultaneously (i.e. when supporting the crane on outriggers).

**ALL
AXLES**

14. Switch axles 1 and 2 up/down

With this switch the cylinders of axles one and two can be moved in and out.

**LEFT
3-4**

15. Switch axle 3 left-hand side up/down

With this switch the cylinders on the left side of the third and fourth axle can be moved in and out.

**RIGHT
3-4**

16. Switch axle 3 right-hand side up/down

With this switch the cylinders on the right side of the third and fourth axle can be moved in and out.


17. Switch/indicator lamp levelling

18. Switch/indicator lamp driving/blocking.

19a. Indicator lamp off the road mode

19b. Indicator lamp block
20. Indicator lamp maximum pressure outrigger-/suspension system

This lamp goes on and a buzzer sounds at the rear outriggers as soon as the pressure in the outrigger/suspension system becomes too high. This may happen when the outriggers, the axles or the outrigger beams are fully in or out, or because there is an obstacle in the way when extending the outrigger beams.

During levelling operation and when moving the axles up or down, this light could also go on. This does not present a problem.

When the outrigger/suspension system is not operated, this indicator lamp shows a malfunction. (I.e. a not correct functioning switch)



Outrigger Operation (on the dashboard from left to right)



22. Switch outrigger beam front left-hand side retract/extend



23. Switch outrigger front left-hand side retract/extend



24. Switch outrigger beam rear left-hand side retract/extend



25. Switch outrigger rear left-hand side retract/extend



26. Switch outrigger front right-hand side retract/extend



27. Switch outrigger beam front right-hand side retract/extend



28. Switch outrigger rear right-hand side retract/extend



29. Switch outrigger beam rear right-hand side retract/extend

30. Switch outrigger controls on/off

Switch off the outrigger controls when the outriggers are not operated or when the crane is rigged up/rigged down or in operation. The remote control is also de-activated. Failing to switch off the controls means the crane can not be set to the full hoisting program (full support base).

32. Ignition lock

By turning the key to the right, three positions are possible, from left to right:

0 = ignition off

1 = Contact

2 = starting

33. Operating lever retarder/cruise control/ESC

With this lever the retarder can be adjusted by 4 different positions. The cruise control and the ESC (Engine Speed Control = temporary increase of the rpm) can also be adjusted by means of this lever.



34. Voltmeter batteries

On this meter you can read the battery condition. The meter must be in the middle (approx. 24 V)



35. Oil-pressure gauge lubrication circuit

When starting, this gauge will read approx. 5 bar (72.5 PSI). As soon as the oil is warm approx. 3 bar (43.5 PSI).

37. Lever parking brake

Pulling this lever backwards the parking brake is engaged. Pulling out the knob and pushing the lever forwards will release the parking brake.

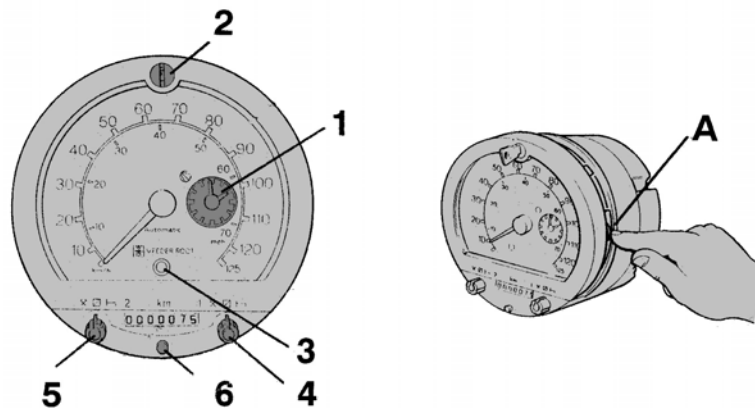
38. Speedometer/tachograph

The truck is equipped with a tachograph. On this device you can read the driving speed and the number of kilometres (miles) driven. The tachograph also contains a clock (1). This clock drives a diagram disc. On this disc the activities of the driver are written by means of scribes. The disc can be replaced by opening slot 2 (see Picture 2-8). Never leave a disc in the tachograph for longer than 24 hrs (else it would overwrite itself). In case there is no disc in the tachograph, indicator lamp 3 will light up.

By means of the switches 4 and 5 (Picture 2-8) the drivers' activities can be shown. Indicator lamp 3 goes on as soon as the driving speed exceeds 80 km/h (50 mph). When at a certain speed button 6 is pressed, exceeding this speed will light up the indicator lamp. However, when the ignition is switched off, the indicator lamp will be set to 80 km/h (50 mph).

The clock may be set to the correct time by operating wheel A.

For more details on how to use the tachograph we refer to the tachograph manual.



Picture 2-8

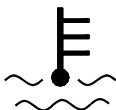
39. Revolution counter

On this counter you can read the diesel engine rpm. The revolution counter has a built-in hour counter. On this counter you can read the number of operating hours of the diesel engine.



40. Fuel gauge

The gauge only functions when the ignition is switched on.



41. Coolant temperature gauge

On this gauge you can read the coolant temperature. In the diesel engine safety system an overheating sensor is built-in. As soon as the temperature exceeds 110 °C (230 F), it activates the horn. The engine must be switched off immediately.

42. Air-pressure gauge circuit 2

It indicates the air-pressure in brake circuit 2. When the pressure is below 5.5 bar (80 PSI), indicator lamp 78 will light up. The crane must not be driven.

43. Air-pressure gauge circuit 1

It indicates the air-pressure in brake circuit 1. When the pressure is below 5.5 bar (80 PSI), indicator lamp 78 will light up. The crane must not be driven.

44. Oil temperature retarder (optional)

During normal use the temperature does not exceed 130°C (266 F). If the indicator enters the red zone, you have to gear down or set the retarder at a lower value. If this does not help, the retarder must be switched off. In the red zone the oil temperature is too high and at 145°C (293 F). You will hear an acoustic warning signal.

46. Oil-pressure gauge

On this gauge you can read the pressure in the hydraulic system when supporting the crane on outriggers



48. Switch/indicator lamp transverse differential lock



51. Switch longitudinal differential lock



53. Heating fan

With this selector switch the heating fan can be set at 3 speeds and switched off.



By turning this rotary knob the heat supply can be continuously regulated.



55/56 Cab lighting

The driver and co-driver can operate the cab lighting by operating the switch (no. 55 + 56) on the dashboard. The lighting will also go on when opening the door. We advise you not to switch on the cab lighting when driving in the dark, to prevent annoying reflections in the windscreen.

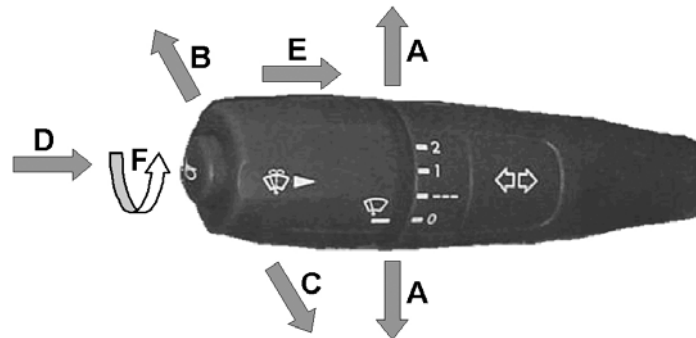
60. Selector switch gear shift high/low, neutral

With this switch the off-the-road (Low) or on-the-road (High) gear can be selected. This is indicated by indicator lamp 57.



Transfer case gear shift high/low may only be operated when the vehicle stands still!

68. Steering column switch



Picture 2-9

- A. With this switch the direction indicator is controlled.
- B. Pushing the switch forward switches on the full beam headlight.
- C. Pulling the switch backwards you can give light signals.
- D. Pressing the switch tip towards the steering wheel activates the horn.
- E. Pressing the entire outer part of the lever towards the steering wheel activates the windscreen washer.
- F. Turning the outer part activates the windscreen wipers. The ---- position is intermittent. Position 1 is normal and position 2 high speed wiping.



76. Warning lamp charging voltage batteries

If the charging voltage of the batteries is too low, this indicator lamp will go on.



78. Warning lamp air-pressure

If the air-pressure in brake circuit 1 or 2 is below 5.5 bar (80 PSI), this indicator lamp will go on. The crane must not be driven. If this lamp is on after starting the engine, leave the engine running at idling speed until the air-pressure is 5.5 bar (80 PSI). The lamp will go out.



82. Indicator lamp flame starting system

This lamp goes on when pre-heating the engine. As soon as it goes out, the engine may be started.



83/85 Electrically operated door windows left/right

The door windows can be opened and closed with these switches. At the co-driver's side there is a switch on the dashboard. All these switches only function with turned on ignition and closed door.



84. Aeronautical warning light on tower head and jib head

With this switch the aeronautical warning light on the tower head and jib head can be switched on and off.

2.4. Driving the Spierings crane



The truck driver must observe the locally applicable rules for driving a crane on the public roads at all times.

Do not exceed the axle loads as mentioned on the STGO-plate (England).

While driving and manoeuvring the crane, the driver must be aware of the crane's unusual form, measurements and steering characteristics.

Note that:

- Crane parts sticking out at the front and rear
- The crane's height is over 4 metres (13 ft) (pay attention to low passages and low branches)
- The crane's width is 2.75 metres (9 ft) (at narrow passages this could present an obstacle for other traffic)
- The crane has a small turning circle thanks to the opposite steering of the rear axles



CAUTION!

The rear of the crane swerves out when you take a bend!

2.4.1. Starting



CAUTION!

Do not run the diesel engine in closed or unventilated rooms. There is a high risk of suffocation.

Before starting the engine, the transmission must be put in neutral and the parking brake must be engaged.

While pre-heating the indicator lamp is on. As soon as the pre-heating is done, the lamp goes out and the engine can be started.

When the engine is running the indicator lamps for oil pressure and battery charging must go out. Only when the oil pressure lamp is out, the engine speed may be increased. When the engine runs too hot or the engine oil pressure is too low, the horn will sound. If the horn keeps sounding, the engine must be switched off immediately.

The lamp for steering circuit 2 will remain on while the vehicle stands still. It will go out the moment the vehicle starts moving.

In order to drive, the air-pressure in the system must be at least 5.5 bar (80 PSI). Below this pressure the clutch can not be pressed and the parking brake can not be released when operated.

After a cold start you must drive in low gear and at low speed until the coolant temperature reaches 50° C (122 F).

During running in (1500 km (932 miles) or 30 operating hours) we advise you not to load the engine to its maximum. Gear down in time. A relatively high rpm causes less damage than overload at low speed.

2.4.2. Turning off the engine

The engine can be switched off by turning the ignition key to the 0-position.

If the engine has run for a longer period of time, we advise you to leave the engine running at idling speed for a few minutes before switching it off, to prevent the coolant and turbo from overheating.

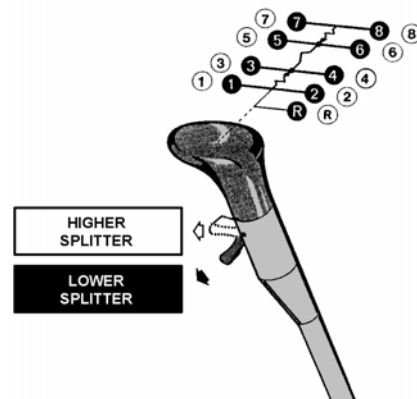
2.5. Driving on the road

The gearbox has 8 synchronized gears; they are divided in a low range (1st - 4th) and a high range (5th - 8th). To shift between the two ranges, the shift lever must be in neutral position and be pushed to the right through a slight resistance.

Subsequently the high range gears can be engaged. To return to the low range, the gear shift lever must be put in neutral and be pushed to the left.

Refer to the diagram in Picture 2-10.

Every gear can be shifted in an intermediate gear; the so-called splitter. Shifting to a lower or higher splitter or v.v. is done by operating the splitter switch. Then press the clutch and release it again.



Picture 2-10



Caution!

While gearing down from high to low range, the driving speed must be below 30 km/h (19 mph)!

Reverse gear is not synchronized, it may only be engaged when the vehicle stands still and the engine runs at idling speed. Also in reverse you can use the high and low splitter.

2.6. Braking system

All axles are equipped with drum brakes. The crane is equipped with three braking systems:

- Operating brake
- Parking brake (of axle 2 and 3)
- Vacuum brake/engine stop
- Retarder (Option)

2.6.1. Operating brake

The operating brake is operated with the brake pedal and works fully pneumatically. The air pressure is indicated on the dashboard by two air-pressure gauges. If the pressure is below 5.5 bar (80 PSI), it is indicated by the indicator lamp on the dashboard. The crane must not be driven.

The operating brake is fitted with an ABS-system (Anti-Blocking-System). Especially on slippery roads, it prevents the wheels from blocking when the operating brake is operated with full force. This way the vehicle remains controllable at maximum brake force while the vehicle slows down optimally.

At a speed under 7 km/h (4.4 mph) the ABS does not work and the indicator lamp on the control panel is on

2.6.2. Parking brake

The parking brake is engaged when the parking brake lever is moved backwards. This bleeds the spring loaded brake boosters and engages the brake. When pulled fully backwards, the lever is locked and the parking brake remains engaged. Pulling out the knob on the lever and pushing the lever forwards will release the parking brake.

If the air pressure for the operating brake is too low, the parking brake is used to slow down the moving vehicle. Move the parking brake lever gradually backwards. Once operated the parking brake can not be released until the air pressure is back to normal.

2.6.3. Vacuum brake/engine stop

The vacuum brake works by closing the fuel supply. Also the exhaust is closed by means of a valve. The vacuum brake control is to the left of the clutch pedal on the truck cab floor. While this foot switch is pressed the vacuum brake is active. The vacuum brake is used to slow down through the engine (e.g. when travelling down-hill).



Caution!

While the vacuum brake is in use, the engine speed may not drop below 2500 rpm!

2.6.4. Slowing down using the retarder (optional)

For slowing down when driving at high speed or on long stretches down-hill, the use of the retarder is profitable. Sparing the operating brake, the operating brake is fully available when it is really needed. The retarder is activated with the control lever on the control panel. The indicator lamp (4a) on the control panel indicates if the retarder is activated.

Using the accelerator pedal is not possible when the retarder is activated.

In case of frequent use of the retarder the oil temperature can rise considerably. If so, the retarder control reduces the braking force. Keep an eye on the oil temperature gauge while the retarder is in use (*Picture 2-11*). As soon as the indicator enters the red (130-150°C (266-302 F)) the oil temperature has risen too high. Gear down if the oil temperature is too high and put the retarder in a lower position or switch it off. If this does not help to lower the oil temperature, the retarder will automatically switch off.

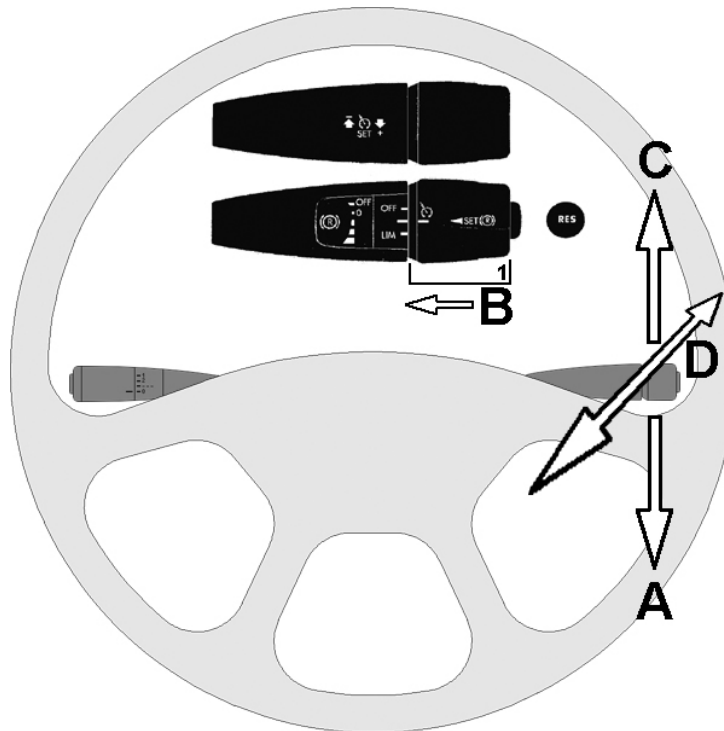
When the retarder was used frequently during travel, the engine may only be switched off when the oil temperature gauge indicator is in the green.



Picture 2-11

2.7. Retarder/ESC/CC

To prevent excessive wear to brakes and clutch the retarder may be used. The retarder can be controlled with the control lever at the right of steering column (33) (*Picture 2-12*).



Picture 2-12

By moving the lever backward (direction A) the retarder can be set in three positions:

1. Approx. 33% of the maximum brake torque
2. Approx. 66% of the maximum brake torque
3. maximum brake torque

Move the lever to its start position to switch off the retarder option.

2.7.1. The Bremsomat

Using the bremsomat the retarder is set to a maximum speed. A constant speed is ensured during driving down hill.

By pushing the tip of the handle (1) towards the steering column (direction B), the Bremsomat is activated and set to the speed of that moment. (*Picture 2-12*)

De-activate the Bremsomat by pushing the lever forwards (direction C).

2.7.2. Cruise Control (CC)

The **Cruise Control** enables you to drive at a constant speed without having to operate the accelerator pedal. The cruise control only works when the travel speed is over 30 km/h.

The CC can be switched on by:

4. Tipping the lever upwards/downwards (*Picture 2-12, D*)
The actual speed at that moment is saved in the memory until the ignition is switched off.
5. Pressing the button "RES".
If the CC is already in use since switching on the ignition, the speed will go to the last set value.



When CC is activated, you can increase/lower the speed by tipping the lever upwards/downwards. (While tipping, the speed changes with 0.5 km/h (0.3 mph) per tip.)

To switch off the Cruise Control, turn the tip of the lever (1) shortly in position "OFF".

		Result		
		Switches CC off	Prevents switching on CC	Switches CC on
Operated	v = outside limit values			
	Park brake			
	Clutch			
	Operating brake			
	Vacuum brake			
	Position "OFF"			
	Lever direction D			
	Button "RES"			
	Var. speed limit			
	Retarder			

Besides braking, the CC will also be switched off when the deceleration is more than 1.4 m/s^2 (3.1 mi/hs). (E.g. in case of a collision.)

2.7.3. Variable vehicle speed limit

De variable vehicle speed limit gives the opportunity to set the vehicle speed to a desired speed limit. The variable vehicle speed limit only works when the travel speed is over 30 km/h (19 mph).

By turning the tip of the lever (1, *Picture 2-12*) shortly to the "LIM" position, the vehicle speed at that moment will be stored as the desired speed limit value. This value can be adjusted by tipping the lever up-/downwards (direction D).

Turn the tip of the lever (1) in its centre position or press the gas pedal fully in to de-activate the variable vehicle speed limit option.

2.7.4. Speed control (ESC)

The **Engine Speed Control** of the diesel engine can be set as long as the travel speed stays below 9 km/h (5.6 mph). Use this function for e.g. operating the outrigger support system. By pressing the button "RES" the engine speed will increase to 1260 rpm. (*Picture 2-12*)

By tipping the lever upwards or downwards (C) the rpm can be increased/reduced.

In the table below you will find the condition for switching “ESC” on or off.

		<i>Result</i>		
		Switches ESC off	Prevents switching on ESC	Switches ESC on
Operated	v = outside limit values			
	Park brake disengaged			
	Clutch			
	Operating brake			
	Vacuum brake			
	Postition “OFF”			
	Lever direction D			
	Button “RES”			

By turning the tip of the handle (1) to the “OFF” position, the speed control is de-activated.

2.8. Driving off the road

2.8.1. Off the road gear shift high/low transfer case

When driving off the road or at low speed is required (e.g. driving with erected tower) you can put the gear shift high/low in low speed (L).



Caution!

The gear shift high/low may only be operated when the vehicle stands still!

The position of the gear shift high/low is indicated by indicator lamps on the control panel (H or L). Shifting to another position takes about 5 seconds.

2.8.2. Longitudinal differential lock

When there is insufficient traction while driving off the road, the longitudinal differentials can be locked with button "longitudinal differential lock".

Engagement of the longitudinal differential lock is indicated by the indicator lamp next to the switch.



Caution!

The longitudinal differential lock may only be engaged/released when the vehicle stands still!

Driving with engaged longitudinal differential lock is only allowed when the vehicle moves in a straight line!



After releasing the longitudinal differential lock, make sure the indicator lamps are out! If this is not the case, slowly zigzag a little when driving off; this should make the lamps go out.

2.8.3. Transverse differential lock

If after engaging the longitudinal differential lock there is still too little traction, also the differentials in the axles may be locked.

Do this by operating the button "transverse differential lock". To keep the transverse differential lock engaged, the button must be pressed. As soon as the button is released, it will snap back and release the transverse differential lock.

When the axles are locked, the indicator lamps 49 and 50 will indicate it.

Turn off the transverse differential lock before driving on the road.

Caution!



The transverse differential lock may be engaged/released provided the vehicle stands still and the longitudinal differential lock is engaged. (Indicator lamp 52 is on)

Driving with engaged longitudinal differential lock may only when the vehicle moves in a straight line!



After releasing the transverse differential lock differential lock and longitudinal differential lock make sure the indicator lamps are out!

2.9. Parking

Put the transmission in low range (1-4) and engage the parking brake. Fully lower the vehicle. Switch off the engine and subsequently the battery switch.

When parking up-hill: transmission in 1st gear, parking brake engaged.

When parking down-hill: transmission in 1st gear reverse, parking brake engaged.

When you store the (rigged down) crane temporarily, you risk freezing due to water accumulated in the tower. To run off the water you can put the (rigged down) crane inclined as follows:

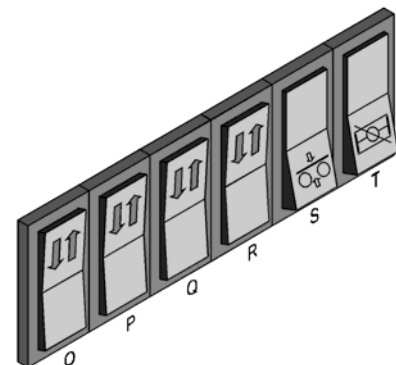
1. Extend the front axles until the front axle suspension cylinders are fully extended.
2. Subsequently retract the rear axles until the rear axle suspension cylinders are fully retracted.
3. Make sure the truck is still standing on all its wheels! (all tires are still bulging)

2.10. Axle height adjustment

The axles are connected to the chassis by means of hydraulic cylinders. Each cylinder is provided with a accumulator, so that the axles can compress.

The suspension system can be controlled from the truck cab (*Picture 2-13*). This system enables you to adjust the axle height according to your needs. The suspension can also be blocked; this is relevant when supporting the crane on outriggers and when driving with an erected tower.

The suspension system operation is explained below.



Picture 2-13

- O. switch cylinders of all axles; in / out
- P. Switch cylinders axles 1 and 2; in / out
- Q. switch cylinders left-hand side; left wheel axles 3 and 4 in / out
- R. switch cylinders right-hand side; right wheel axle 3 and 4 in / out

In this way, the crane set-up can be levelled on sloping grounds.

As soon as the end position is reached, a buzzer will sound and indicator lamp 20 on the control panel will go on.

“Levelling” (S)

During levelling, the axle suspension is automatically adjusted in travelling mode. This is useful when the axle height had become unsettled due to e.g. outrigger operation or lengthy standstill. After using the crane it should always be levelled!

The crane must be levelled on a horizontally level base and the levelling is finished when there is no more movement in the vehicle and the indicator lamp in the levelling switch is on. Now reset the switch.

Levelling can only be done when the tower is resting on the truck.



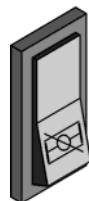
Caution!

Switch “T” must be on “driving” for levelling operation!

“Driving” (T)

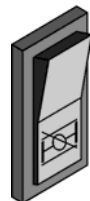
In this switch position the suspension is activated. The switch must be in this position while driving on the road.

Before driving off, you have to level first



“Blocking” (T)

In this mode the axles can not compress, enabling a stable travel. In blocking mode the indicator lamp on the switch for blocking/driving is on. In this mode the axles can be moved up or down separately by means of 4 switches. When the system is blocked, indicator lamp 19b is on.



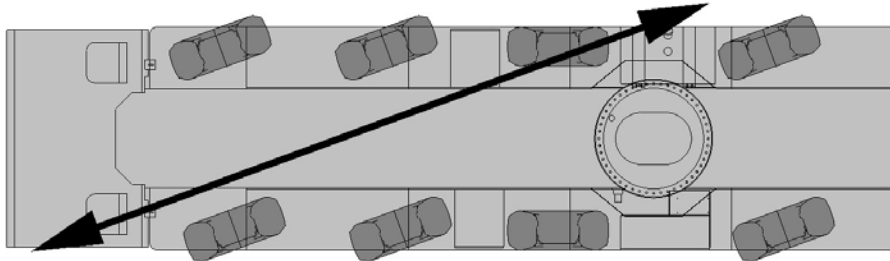
“Off the road mode”

To shift the crane in off the road mode, you have to proceed as follows:

- Block the axles.
- Move the cylinders of all axles out. The cylinders will not go out all the way, so that some room to move remains.
- Release the suspension to re-activate the suspension.

2.11. Independent rear axle steering

With this option, it is possible to steer axle 4 hydraulic, independent from the other steered axles. By doing so, sideway driving is possible (*Picture 2-14*).



Picture 2-14

2.11.1. Driving with independent rear axle steering



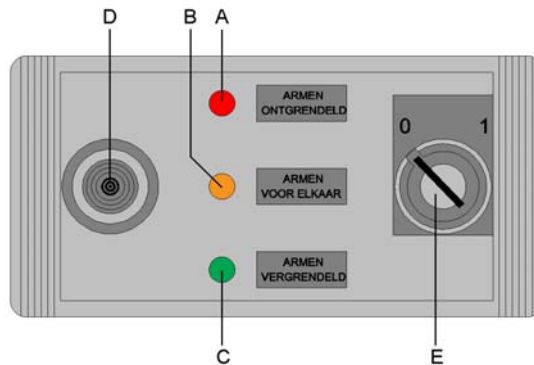
In order to use the independent rear axle steering the crane should be in transport mode!

- Block the suspension (28).
- Pull in all suspension cylinders (13).
- In the truck cab on the driver's side, there is mounted a switch box (*Picture 2-15*). The green lamp will go on (C; "rear axle steering locked") and the orange lamp too (B; "Locking position").
- Turn the key (E) in position 1. The steering arm will be unlocked. The green lamp will go off and the red lamp will go on (A; "Rear axle steering released"). If the arms aren't in line, the orange lamp will go out too. The longitudinal differential lock will automatically be engaged.
- Push out all axles (13). When *rear axle steering* is switched on, axle three remains retracted. Make sure, that the wheels of axle 3 come off the ground.



Push out axle 1, 2 and 4 such a way that axle 3 is approx. 10 cm (4 inch) from the ground.

- With the lever (D) you can steer the rear axle



Picture 2-15

2.11.2. Limits of using the independent rear axle steering



Caution!

Driving with erected tower is not permitted!

Driving with transverse differential locked is not permitted!

Only drive in first or second gear, forward or backward.

The maximum driving speed in the independent rear axle mode is electronically limited to 10 km/h (6.2 mph)

2.11.3. Disengage the independent rear axle steering

- Fully retract all axles (13), until axle 3 (almost) reaches the ground.
- Steer the rear axle until the steering arms are in line. (Use the steering lever.)
- Turn the key to position 0 (Picture 2-15). The steering arms of axle 4 will be locked. The red lamp goes out and the green will go on. The longitudinal differential lock will be disengaged.
- The suspension will return in driving position and all the gears can be shifted again.



Check if the indicator lamps of the longitudinal differential lock are out.

- Level the crane (17)
- De-block the suspension (18)

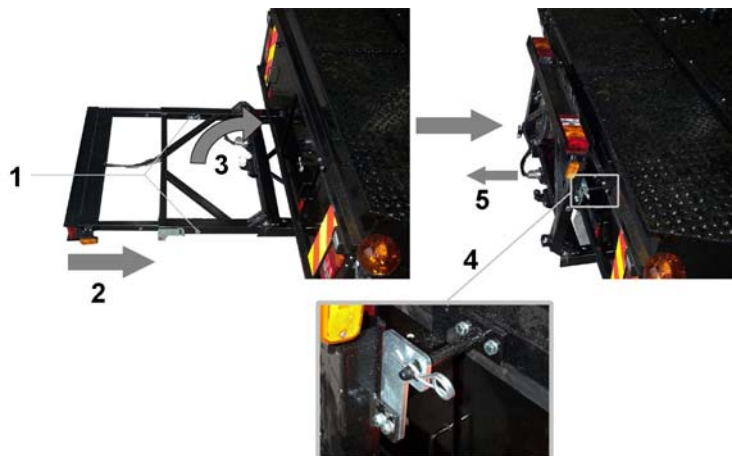
2.12. Driving with erected tower

Refer to crane manual.

2.13. Driving with a trailer

To tow a trailer the crane is equipped with a towing hook with a 7-pins socket for lighting. To link up the trailer, first the bumper must be folded up (Picture 2-16);

- Remove the safety clips from the 2 pins in the case and pull out the 2 pins.
- Slide the rear part to the front until the pins can be inserted in the next hole. Then lock them with the safety clips.
- Remove the safety clip from the pin in the frame and fold up the complete bumper against the vehicle frame.
- Now lock the bumper with the safety clip.
- Then pull out the plug from the socket.
- Link up the trailer and plug the trailer plug in the socket.
- Check the working of the lights of the trailer.



Picture 2-16

2.14. Towing the crane



Always inform Spierings Cranes before towing the crane.

2.14.1. Towing when the diesel engine can still run

When the crane must be towed and the diesel engine can still run, you have to proceed as follows:

- Shift the transfer case in neutral, by operating switches (60) and (59) in the middle console in the truck cab.
- Shift the transmission in neutral.
- The brake air circuit is kept under pressure by the running engine.
- The power steering remains activated by the running diesel engine.
- Remove the cover plate in the middle of the front bumper and attach the supplied shunt coupling with bolts.
- Link the towing vehicle with a tow bar to the crane shunt coupling. Now the crane may be towed.

2.14.2. Towing when the diesel engine is out of order

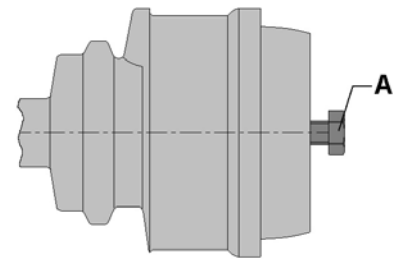
If the diesel engine is out of order you may proceed in the same way as with a running diesel engine. However, there are a number of additional problems:

- Air pressure is no longer present. No brakes available.
- The park brake can not be loosened.
- When the air vessel of the secondary is pressure less, the transfer case can not be shifted neutral.
- Power steering is not (fully) available.

Releasing the Parking Brake

When there is no air pressure the parking brakes can be released as follows:

Unscrew the bolts at the rear of the spring brake boosters of axles 2 and 3 (Picture 2-17, A). The spring tension is removed from the brake, so it is released.



Picture 2-17

External Filling Nipple Air Circuit

The shifting in neutral of the transfer case is air powered. If the secondary air circuit vessel is empty, it must be filled, by means of the external filling nipple. You will find this nipple on the right-hand side under the truck deck. As the complete air circuit will be filled through the external nipple, also the parking brake boosters may be released.

Power Steering

The steering pumps that are driven by the diesel engine do not supply any oil, so the power steering will be lost for a great part. Only the emergency steering pump supplies oil for the power steering. However, it only supplies oil while the crane is moving. Therefore, the steering gets a lot tougher as only one pump is available instead of two.

3. Maintenance



For “normal working conditions” we have in view:

- A working-week of 5 day's/40 hours
- 15.000 – 20.000km/year
- Surroundings temperature: -15 - 40°C (5 – 104F)



All specifications concerning oil and filters can be found in chapter “Technical data”.

3.1. General



All warning and safety prescriptions in this manual must be followed. Always look after safety in general.



Never repair the truck or change an adjustment without empathic permission and the correct education. Repairs or adjustments which are not correctly solved can result in dangerous situations.

3.1.1. Clothing



During maintenance on the truck, the right clothing suitable for the workshop must be worn. Avoid i.e. loose clothing, long hanging down hair and ornaments which can be entangled between moving components.

3.1.2. Surroundings



Keep the crane's surroundings clean and free of oil and other liquids. This to prevent dangerous situations.

3.1.3. Diesel engine



Do not run the engine in a closed or non-aired room. There is danger of suffocation.

3.1.4. Moving parts



Stay on a safe distance from rotating and/or moving components.

3.1.5. Oils and coolant



Various kinds of oil, lubrications, coolant, window washer fluid, battery acid and diesel oil can be harmful to your health when touched. Avoid any physical contact with these substances.

3.1.6. Environment



In order to reduce environmental pollution to a minimum we advise you to comply with the following rules:

- Do not pour used oil, hydraulic fluid and coolant in sewers or in the ground.
- Make sure all used fluids, batteries, oil filters and other chemicals are separated and sent to the respective authorities for destruction or recycling.
- See to proper and regular truck maintenance. A well maintained engine contributes to saving fuel and reduces polluting exhaust fumes.

3.1.7. Refreshing oil/cooling system



Be careful with oil refreshing. Hot oil can cause serious bodily harm.

Do not remove the coolant tank filler cap when the engine is at operating temperature.

3.1.8. Fire-risk



To prevent fire-risk, make sure no light inflammable substances are in the surroundings of the engine.

3.1.9. Cleaning of components



While cleaning with a high-pressure cleaner the following rules must be complied with:

- While cleaning the radiator/intercooler, make sure the cooler fins are not damaged.
- While cleaning the engine compartment, do not point the nozzle directly to electrical components like starter motor, alternator, etc.
- Make sure no water penetrates through the breathers of gearbox, transfer case and differentials.



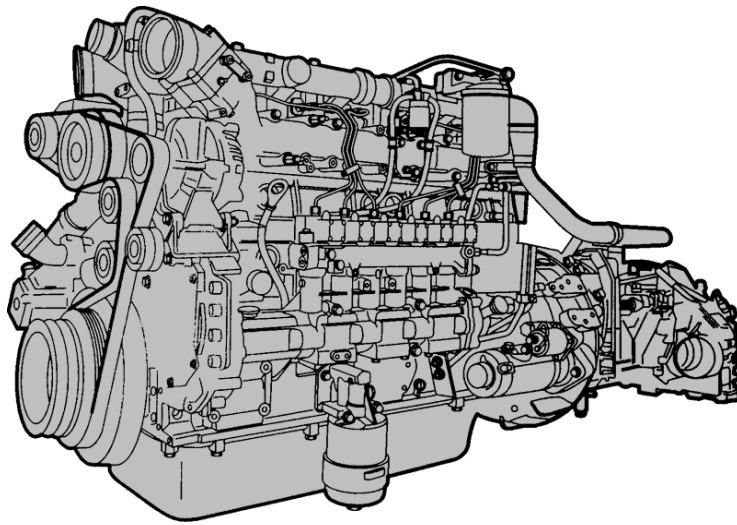
3.2. Maintenance plan AT4 truck

Main group	Maintenance	Daily maintenance	Weekly maintenance	2-monthly maintenance	Yearly maintenance (15.000km)	2-Yearly maintenance	5- Yearly maintenance
Diesel engine	Engine oil	Check			Refresh		
	Oil filter				Change		
	Cooling system			Check			
	Coolant	C	heck			Refresh	
	Anti-freeze				Check		
	Radiator/intercooler				Check		
	Air system			Check			
	Air filter	Cle	an		Change		
	Fuel system			Check			
	Fuel filter				Change		
	Water separator		Drain				
	Filter water separator				Change		
	V-belts				Check		
	Exhaust system			Check			
	Valve clearance				Check		
Drive-line system							
	Gear box			Check			
	Oil gear box			Check	Refresh		
	High/Low transfer case			Check			
	Oil High/Low transfer case			Check	Refresh		
	Axles			Check			
	Oil differentials			Check	Refresh		
	Oil hubs			Check	Refresh		
	tires		Check				
	Tire pressure			Check			
	Brake lining				Check		
	Venting the clutch			Check			
	Clutch fluid					Refresh	
Steering system	System			Check	Align		
Electrical system							
	Lighting	Check		Check			
	Instrument lighting	Check		Check			
Hydraulic system	Batteries			Check			
	Hydraulic oil		C	heck			Analyze
	Return oil filters				Change		
	Accumulators				Check		
	Hoses and connections			Check			



Main group	Maintenance	Daily maintenance	Weekly maintenance	2-monthly maintenance	Yearly maintenance (15.000km)	2-Yearly maintenance	5- Yearly maintenance
Pneumatic system						Change	
	Air dryer filter						
	Air vessels		Drain				
	Oil atomizer			Check			
	Water separator			Drain			
	Braking pressure				Check		
Grease system	Hoses and connections				Check		
	Central grease system		Clean	Check			
Diverse	Manual greasing			Grease			
	Window washer liquid		Check				
	Extinguisher				Check		

4. Diesel engine



Picture 4-1

Technical data

Brand/type	DAF XE 315 C1
Fuel system	Water cooled four stroke with direct injection
Inlet system:	Turbo-intercooler
Engine capacity:	12,58 litres
Maximum performance:	315 kW at 1900 ^{rpm} / _{min}
Maximum torque:	1950 Nm at 1100-1500 ^{rpm} / _{min}
Compression ratio:	17,4:1
Bore x Stroke:	130 x 158 mm
Emission level:	Euro 3
Weight:	1080kg (2381 lbs)



Warning!

Only use EN 590 diesel fuel to prevent damage on the fuel system.

4.1. Services in the first period of use

8 weeks after delivery

The first inspection of the truck diesel engine must be carried out by a regional DAF-dealer. At the inspection the DAF-dealer is to fill out the warranty form supplied by Spierings. For this inspection the DAF-dealer will only bill you for the costs of oil and filters.

4-5 months after delivery

Spierings 4 monthly inspection (conform superstructure).

This inspection should preferably be carried out by service staff of Spierings Cranes. The truck diesel engine gets a full maintenance, and the oil in the complete truck drive line is changed. For this purpose Spierings Kranen uses synthetic oil (75W90). This oil does not need changing in all drive line components for two years. The hydraulic filter is replaced. Repairs and defects are carried out under warranty.

At this inspection only the costs of oil, filters and repairs, that are not covered by warranty, are billed to you.

Hereafter the truck is to be serviced according to the maintenance plan as stated in this manual.

4.2. Access to the diesel engine

To gain access to the diesel engine, different cover plates can be removed. The cover plates on top of the engine cowling also can be removed. However, the tower should be in a vertical position.

The cover plate on top of the cabin can be tilted to gain access of the cooling system. (See Picture 4-2)



Picture 4-2

4.3. Engine oil

4.3.1. Check engine oil level



Check the engine oil level every day.

1. Make sure the crane stands on a horizontally flat base.
2. Switch off the engine and leave a hot engine at least 5 minutes so the oil sinks in the crank case.
3. Pull out the dipstick (1) and clean it with a non-fluff cloth.
4. Put the dipstick back in the holder and subsequently pull it out again.
5. Read off the level. The oil level must be between the two marks on the dipstick.
6. Put the dipstick back again in the holder.
7. If necessary, top up the oil. (See 4.3.2 Fill up engine oil)



Picture 4-3

4.3.2. Fill up engine oil

1. Make sure the crane stands on a horizontally flat base.
2. Unscrew the red filler cap (2) (*Picture 4-4*)
3. Always fill up the engine oil of the same brand and type. (In doubt consult Spierings Cranes)
4. Check the oil level with the dipstick. (*See 4.3.1 Check engine oil level*)

4.3.3. Engine oil change



Change the engine oil after every 15.000km or every year during the yearly maintenance service at normal working conditions.

1. Make sure the crane stands on a horizontally flat base.
2. Draining the engine oil should preferable take place when the engine is at operating temperature. The engine must be switched off.
3. Put a trough under the drain plug. (*Picture 4-4, 2*)
4. Remove the cap of the fast drainer (2) at the bottom of the crank case (1) and attach the provided drain hose. This hose will open the plug, so the oil can be drained.
5. Remove the drain hose and place the cap on the fast drainer.
6. Fill the engine with approx. 39 litres engine oil. (*See 4.3.2 Fill up engine oil*)



Picture 4-4

4.4. Engine oil filter

4.4.1. Oil filter replacement



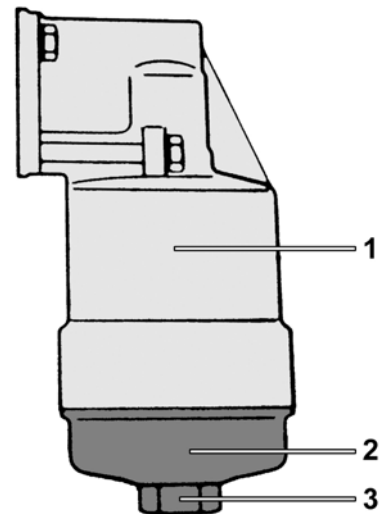
Replace the oil filter after every 15.000km or during the yearly maintenance service at normal working conditions.

1. Put a trough under the oil filter (1) on the left hand next to the crank case (2). (Picture 4-5)



Picture 4-5

2. Unscrew cap (2) several turns until the oil runs off filter housing (1) through outlet hole (3) (Picture 4-6).
3. Remove the filter element from the filter housing.
4. Check the sealing rubber in cap (2) and renew if necessary.
5. Sparingly coat the sealing rubber with engine oil.
6. Place a new filter element in the filter housing.
7. Reinstall the cap and tighten it manually.
8. Leave the engine running a couple of minutes.
9. Check the oil level. (4.3.1 Check engine oil level)
10. Check for leaks.



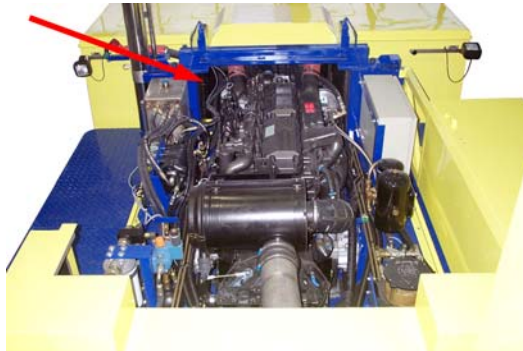
Picture 4-6

4.5. Cooling system



Check every two months for leakages from hoses, tubes, connections and for damage on the radiator, intercooler and fan.

The DAF diesel engine is water cooled. The radiator and intercooler are beneath a cover plate in front of the engine.



Picture 4-7

4.5.1. Check coolant level

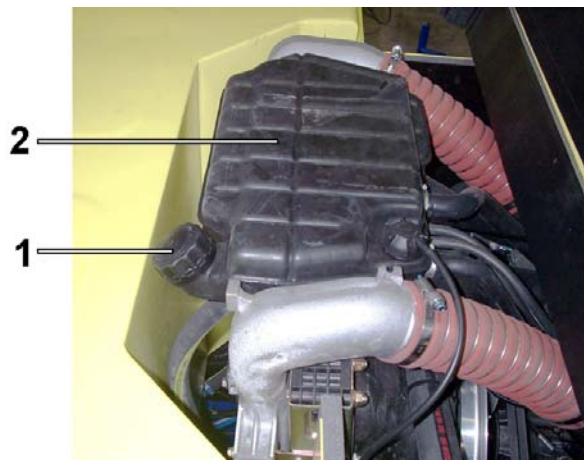


Check the coolant level every week at normal working conditions.



Never remove the radiator cap when the engine is at working temperature.

1. Cool down the engine when hot.
2. Remove the cover plate on top of the cabin by folding it.
3. Carefully remove the filler cap (1) from the coolant tank (2).
4. Check the coolant level through the filler hole.
5. When the coolant level is not seen, fill the tank with coolant. (See 4.5.2 Fill up coolant)
6. Close the filler hole with the filler cap.
7. Close the cover plate.



Picture 4-8

4.5.2. Fill up coolant



Do not add cold coolant to a hot engine. Is this by a particular circumstance inevitable, add the fluid slowly with a running engine.



Coolant is harmful for your health. Protect your eyes and skin.

1. Put the heater knob on "warm".
2. Remove the cover plate on top of the cabin by folding it.
3. Carefully remove the filler cap (1) from the coolant tank (2). (Picture 4-8)
4. Fill up the coolant level to the filler neck.
5. Start the engine and slowly fill the coolant system with coolant.
6. Leave the engine running for some minutes.
7. Switch off the engine and check the coolant level. (4.5.1 Check coolant level)

4.5.3. Change coolant



Change coolant every two years at normal working conditions.

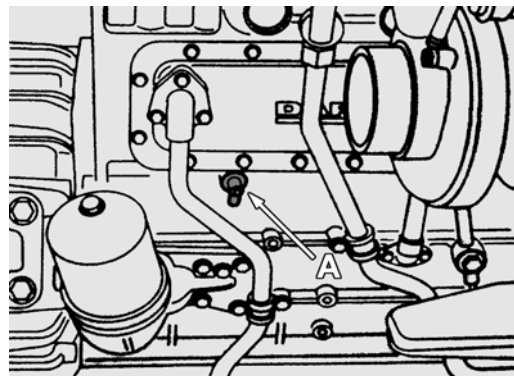


Do not add cold coolant to a hot engine. Is this by a particular circumstance inevitable, add the fluid slowly with a running engine.



Coolant is harmful for your health. Protect your eyes and skin.

1. When hot, cool down the engine.
2. Put the heater knob on "warm".
3. Remove the filler cap from the coolant tank.
4. Put a trough under the drain plugs.
5. Drain the coolant from the engine at point A, Picture 4-9.
6. Reinstall all drain plugs.
7. Fill the cooling system with coolant. (4.5.2 Fill up coolant)



Picture 4-9

4.5.4. Anti-frost



Check the anti-frost concentration every year before winter season.

We advise to check the coolants anti-frost concentration before every winter season.
Use 40% anti-frost on ethyleneglycol-basis.

4.5.5. Radiator and intercooler



Check the radiator and intercooler every year for filthiness.



**Be careful concerning the electrical system when cleaning with water.
Never use a high pressure cleaner for cleaning the radiator.**



Wear safety glasses during cleaning the radiator.

If it is necessary to clean the radiator, the upper cover plate on top of the cabin must be opened. This can only be done when the tower is erected.

- Cleaning the radiator with air pressure

Using air pressure for cleaning the radiator is the easiest way. Aim the air pressure nozzle always parallel to the radiator's cooling segments to prevent damage.

- Cleaning the radiator with cold or warm water

Use for preference a cold cleanser. Let this soak for approx. 10 minutes and wash it away with a dense water beam parallel to the radiator's cooling segments to prevent damage.

4.6. Air inlet system

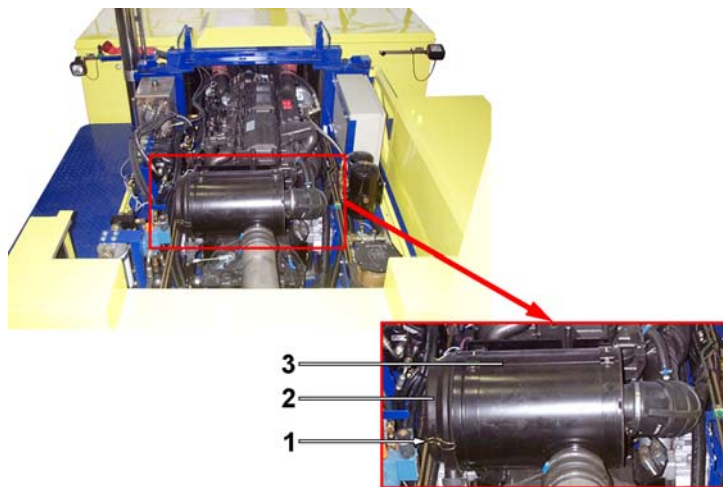


Check the air inlet system every two months for leakages and damage.

4.6.1. Cleaning the air filter



Clean the air filter every week at normal working conditions. When the air filter cartridge and sealing ring is damaged, renew the cartridge.



Picture 4-10

1. Make sure the engine is not running.
2. Remove the left hand side cover plate from the engine compartment.
3. Detach the clips (1) from the air filter and remove the filter cover (2). (Picture 4-10)
4. Remove the air filter cartridge from the air filter housing (3).
5. Check for filthiness inside the filter housing and filter cover. Clean if necessary.

6. Use air pressure (Max. 5 bar (72.5 PSI)) to clean the air filter from the inside. (Picture 4-11)



Picture 4-11

7. Reinstall the filter cartridge after coating the sealing ring with oil. (Use Vaseline)
8. Attach the filter cover with the clips.
9. Reinstall the cover plate.

4.6.2. Air filter cartridge change



Change the air filter cartridge every year at normal working conditions.

1. Make sure the engine is not running.
2. Remove the left hand side cover plate from the engine compartment.
3. Detach the clips (1) from the air filter and remove the filter cover (2). (Picture 4-10)
4. Remove the air filter cartridge from the air filter housing (3).
5. Check for filthiness inside the filter housing and filter cover. Clean if necessary.
6. Install a new filter cartridge after coating the sealing ring with oil. (Use Vaseline)
7. Attach the filter cover with the clips.
8. Reinstall the cover plate.

4.7. Fuel system



Check the hoses, tubes and connections every two months for leakages and damages.



Open fire is prohibited during work at the fuel system. No smoking!

4.7.1. Fuel filter change



Change the fuel filter every 15.000km and during the yearly maintenance service at normal working conditions.

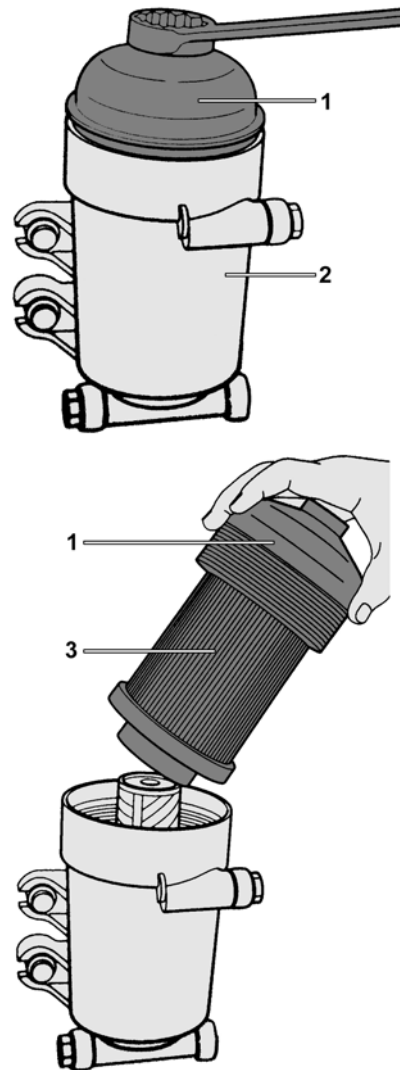
The fuel filter (A) is found on the left hand side of the engine. (Picture 4-12)

The easiest way to reach this filter is to erect the tower and remove all cover plates on top of the engine compartment.



Picture 4-12

1. Make sure the engine is not running.
2. Unscrew the cap (1) from the filter housing (2) and take the cap together with the filter element (3) from the filter housing (see Picture 4-13).
3. Remove the filter element from the cap.
4. Check the sealing rubber in the cap and renew if necessary.
5. Place a new filter element in the cap.
6. Install the cap together with the filter element on the filter housing.
7. Do not screw on the cap too tight.
8. Start the engine and check for possible leaks.
9. Reinstall the centre plate on the engine cowl



Picture 4-13

4.8. Fuel filter/Water separator

The fuel filter/water separator is found at the right hand side of the truck behind axle 3. (Picture 4-14)



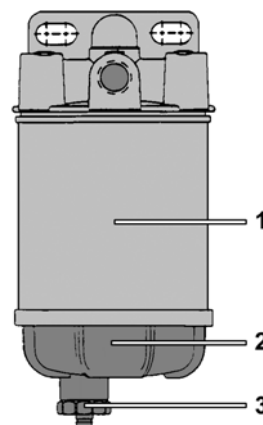
Picture 4-14

4.8.1. Drain the water separator



Drain the water separator every week.

1. Erect the tower
2. Unscrew the drain plug (3) at the bottom of the water separator to drain the water. (Picture 4-15)
3. Close the drain plug when pure fuel is seen.



Picture 4-15

4.8.2. Fuel filter/water separator change



Change the filter inside the water separator every year during the yearly maintenance service at normal working conditions,

1. Make sure the engine is not running.
2. Put a trough under the filter.
3. Unscrew the drain plug (3) at the bottom of the water separator to drain all fuel from the filter. *(Picture 4-15)*
4. Remove the filter element (1) together with the bowl (2) by unscrewing it counter clockwise.
5. Remove the bowl from the used filter element and clean the sealing ring with a clean, non-fluffed cloth.
6. Coat the sealing rings of the bowl and the new filter element with engine oil.
7. Install the bowl onto the new filter element and fill it with pure fuel.
8. Place the new filter onto the filter housing manually.
9. Switch on the engine a few minutes and check for leakages.

4.9. V-belts

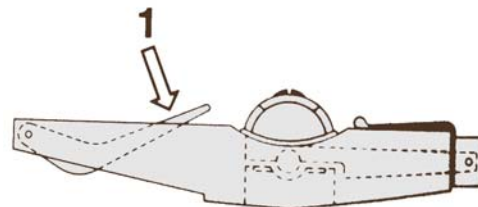
4.9.1. Check the V-belts



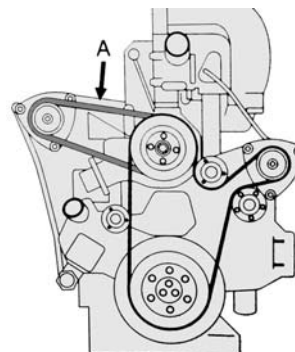
Check the V-belts every 15.000km at normal working conditions and during the yearly maintenance service.

Check the V-belt tension by using a special tool (DAF nr. 1240443)

1. Reset the V-belt tension device by pushing the measuring pawl (1). *(Picture 4-16)*
2. Place the V-belt tension device onto the V-belt in the middle of two pulleys. *(Picture 4-17, A)*
3. Push the tension device against the V-belt until a "click" sound is heard.
4. Remove the tension device carefully. (The measuring pawl must not move).
5. Read out the indicated value. Compare this value with the recommended pretension. *(See Table 4-1)*



Picture 4-16



Picture 4-17

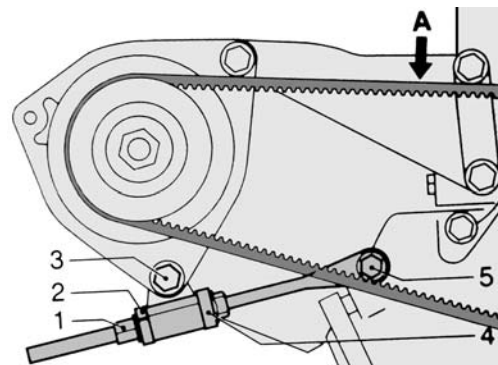
Table 4-1

V-belt tension "AVX" open edge ¹ V-belts in Newton (N)	
	New V-belt²
Adjust tension	1200
Check tension	>800
	V-belt³ in use
Lowest tension	500
Correction tension	700

- 1) V-belts with an open edge are recognizable because no textile is present in the rubber. (With exception of the upper side of the V-belt edge.)
- 2) When a new V-belt is placed, adjust the pretension with the "adjust tension". Check the pretension with the "check tension" after a trail run. When the measured value of the check tension is below the value as described in Table 4-1, adjust the pretension for the minimum "check tension".
- 3) When the V-belt tension is below the "lowest tension", adjust the tension as described for the "correction tension".

4.9.2. Adjust the V-belts

1. Loosen the lock-nut (4) from the turnbuckle. (Picture 4-18)
2. Loosen the bolt (5) of the turnbuckle connected to the water pump.
3. Loosen the lower bolt (3) of the alternator.
4. Loosen the lock-nut (2) from the threaded brush (1).
5. Move the alternator by means of the threaded brush until the correct tension is reached. (See Table 4-1)
6. Fasten the lower bolt of the alternator.
7. Fasten the lock-nuts of the turnbuckle.
8. Fasten the bolt of the turnbuckle connected to the water pump.



Picture 4-18

4.9.3. Gear belt check

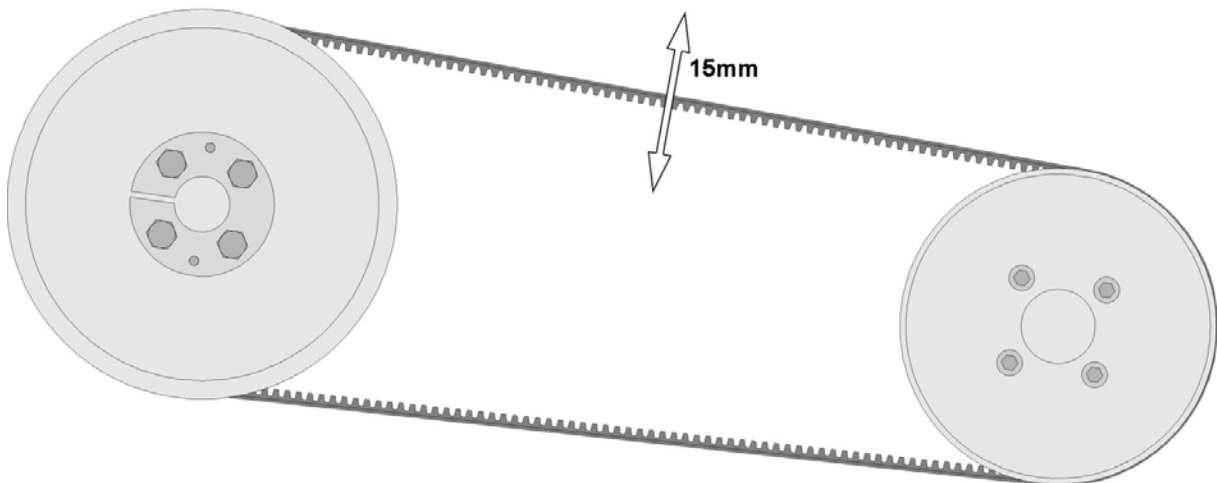


Check the gear belt during the annual maintenance or every 15.000 operating hours under normal operating conditions.

The hydraulic steering pump of steering circuit 1 is mounted on the right hand side on the XE engine. This pump is driven by means of a gear belt.

The transmission of the gear belt will not take place by friction like the V-belt. Therefore the gear belt should not be tensioned.

1. Be sure the engine is shut down.
2. Move the gear belt between the pulleys as shown in Picture 4-19 without force.
3. The deflection should be 15^{+2}_0 mm. **(No less than 15mm!)**
4. Adjust the gear belt if necessary.



Picture 4-19

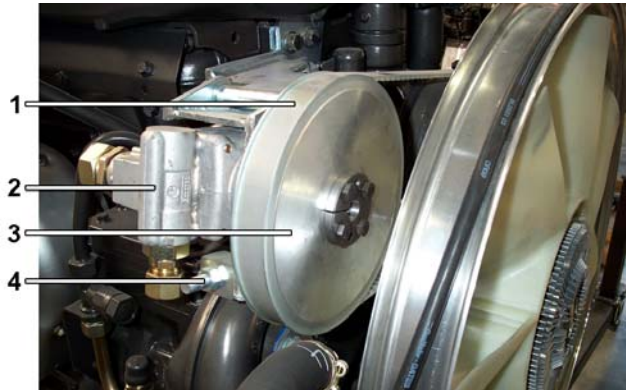
4.9.4. Gear belt adjustment



Warning!

Never tighten gear belts during adjustment. The pump can be damaged this way.

1. Loosen the locknut on the spindle (4, *Picture 4-20*).
2. Re-adjust the hydraulic pump (2) with the pulley (3) using the adjustment nut on the spindle.
3. Adjust the gear belt as described in 4.9.3 Gear belt check.
4. Tighten the locknut on the spindle.



Picture 4-20

4.10. Exhaust system



Check the exhaust system every two months for leakages of the damper, exhaust-pipe and flanges.



Caution!

After running the engine, the exhaust system is hot.

4.11. Check and adjust the valve clearance

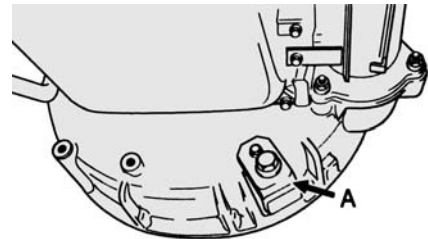


Check, and adjust when necessary, the valve clearance during the yearly maintenance service.



Cleaning the engine before dismantle it prevents that filth will penetrate.

1. Clean the surroundings of the valve cover.
2. Remove the bolts of the differential.
3. Remove the valve cover along with the valve cover gasket.
4. Remove the cover plate from the flywheel housing and place the special tool (DAF nr. 1310477) in the notch of the flywheel.
5. Turn by means of special tool (A) the crank-shaft clock-wise, seen from the distribution side, until the valves of cylinder 1 begins to tumble. The pistons of cylinder 1 and 6 are in the top dead centre. (Picture 4-21)
Tumble: The moment which the inlet valve starts to open and the outlet valve ends to close.



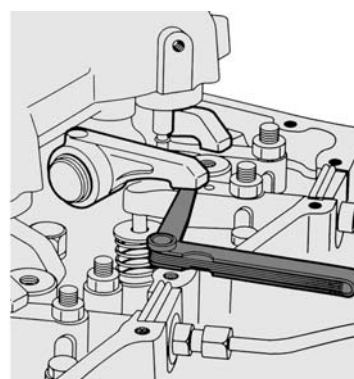
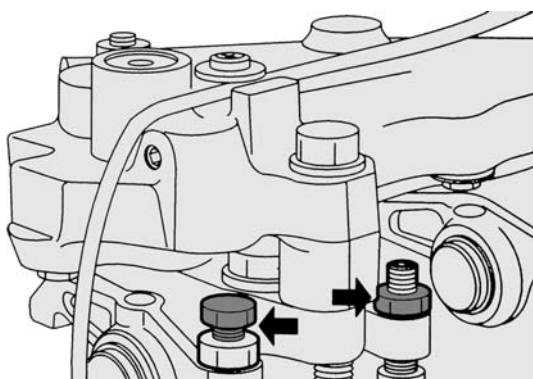
Picture 4-21

6. Check and correct the valve clearance of cylinder 6. Loosen the lock-nut and turn the adjusting screw to adjust the valve clearance. (Picture 4-22)

Valve clearance

Inlet	0,45mm
Outlet	0,45mm

7. By turning the crank-shaft 1/3 at a time, all valves can be adjusted in the following order: 1-5-3-6-2-4

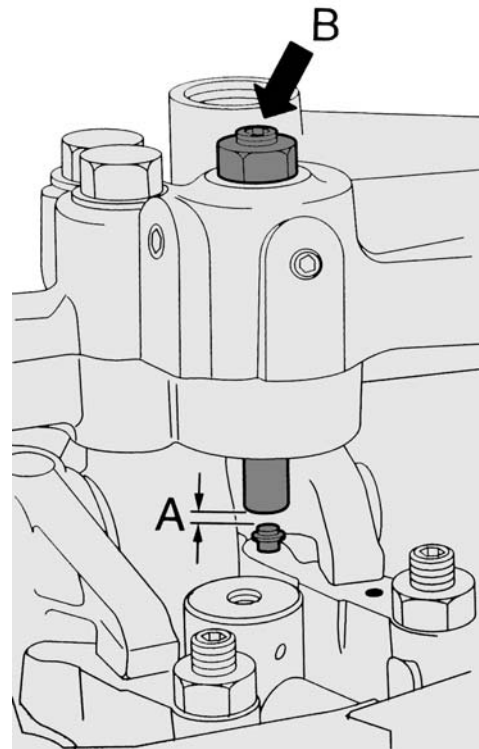


Picture 4-22

8. Clean the sealing surface of the valve casing and valve cover.
9. Reinstall the valve cover with a renewed valve cover gasket.
10. Place all bolts of the valve cover and tighten the bolts with 25Nm of torque.

4.12. Check and adjust the DEB clearance

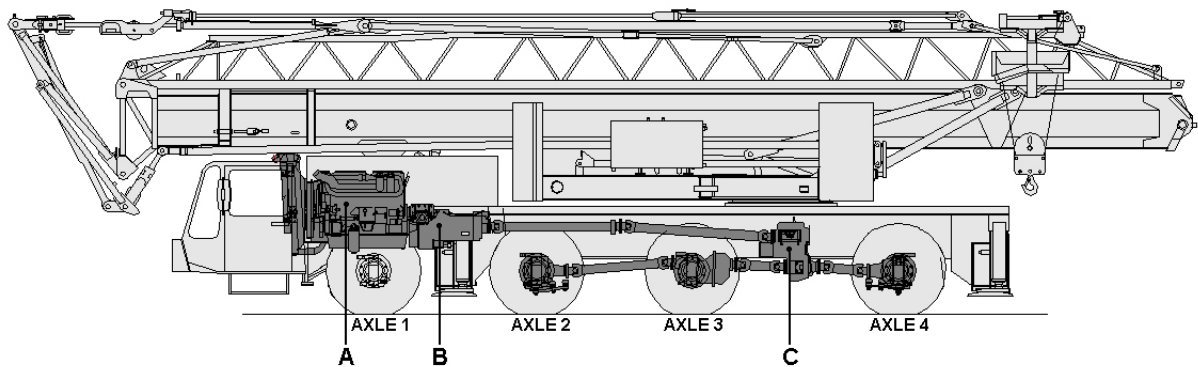
1. Clean the surroundings of the valve cover.
2. Remove the bolts of the differential.
3. Remove the valve cover along with the valve cover gasket.
4. Tighten the bolts of the DEB with 110Nm of torque.
5. Use special tools (DAF 1310477) to get cylinder 1 in its top dead centre. (See 0
6. *Check and adjust the valve clearance)*
7. Adjust the DEB clearance (A) of cylinder 1, 3 and 5 using the adjusting screw (B) for a clearance of A = 1,40mm. (Picture 4-23)
8. Tighten the adjusting screw with 25Nm of torque.
9. Use the special to get cylinder 6 in its top dead centre.
10. Adjust the DEB clearance (A) of cylinder 2, 4 and 6 using the adjusting screw (B) for a clearance of A = 1,40mm and tighten the adjustment screw with 25Nm of torque.
11. Clean the sealing surface of the valve casing and valve cover.
12. Reinstall the valve cover with a renewed valve cover gasket.
13. Place all bolts of the valve cover and tighten the bolts with 25Nm of torque.



Picture 4-23

5. Drive line

Picture 5-1 shows the drive line of the AT4 truck.



Picture 5-1

- A. Diesel engine
- B. Clutch and gear box
- C. High/low transfer case
- D. Axles (1, 2, 3 and 4)

5.1. Clutch and gear box

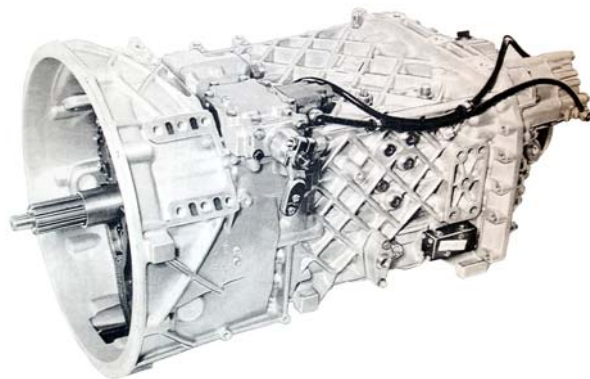
5.1.1. Specifications gear box

The ZF 16S-151 gearbox, installed in the AT4, has 16 gears forward and two gears reverse.

The gearbox shifts automatically (by means of air pressure) between the low and high range.

The dry disc clutch (F&S) between gearbox and engine is single. The operation is hydraulic and air powered. On the gearbox, a hydraulic pump is installed, which is shift on continuously, and is intended for the suspension and outrigger system.

To prevent gearing down to the lower range at too high speed, an extra valve is mounted on the gearbox.



Picture 5-2

5.1.2. Maintenance gear box



Check the gearbox every two months for external leakages and filth on the breather.



Make sure no water penetrates through the breather by using a high pressure cleaner. This could cause serious damage to the gear box.

5.1.3. Check oil level of the gear box

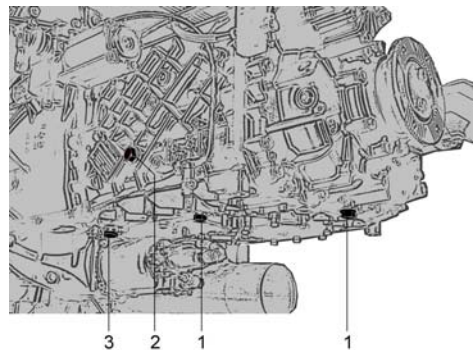


Check the oil level of the gear box every two months at normal working conditions.



To prevent measuring faults: Do not check the oil level when the gear box is hot. The oil temperature must be below 40°C (104F).

1. Make sure the truck stands on a horizontally flat base.
2. Unscrew the plug from the filler hole (2). (Picture 5-3)
3. The oil level should be at the rim of the filler hole. If not, fill it up through the filler hole. (2)
4. Reinstall the plug.



Picture 5-3

5.1.4. Gear box oil change



Change the gear box oil every year during the yearly maintenance service at normal working conditions.



Caution!

The gear box and oil are hot after driving the truck for a while.

1. Make sure the truck stands on a horizontally flat base.
2. Put a trough under the drain plugs.
3. Unscrew the magnetic drain plugs (1 and 4). *(Picture 5-3)*
4. Clean the magnetic drain plugs and renew the seals.
5. Reinstall the drain plugs after draining the oil.
6. Fill the gear box with approx. 7.3 litre oil through the filler hole till the oil level reaches the rim.

5.2. Transfer case

5.2.1. Specifications transfer case

The transfer case is a STEYR type VG2001/396. This transfer case divides the power at the inlet (1, by means of a cardan shaft connected to the driven shaft of the gear box) over two outlets. *(Picture 5-4)*

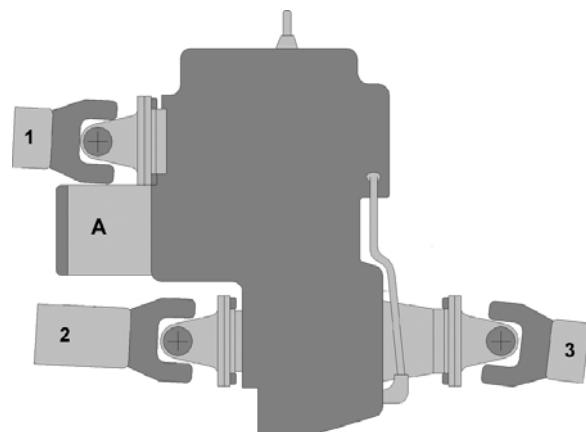
One outlet (2) drives axle 2 and axle 3.

Outlet (3) drives axle 4. *(See Picture 5-1)*

The transfer case has two transmission ratios:

High: 1 : 0,89
Low: 1 : 1,536

A hydraulic pump is driven by outlet axle (A). This emergency pump is used when the engine fails and the vehicle is still moving.



Picture 5-4

5.2.2. Maintenance transfer case



Check the transfer case every two months for leakages and filth on the breather.



Make sure no water penetrates through the breather by using a high pressure cleaner. This could cause serious damage to the transfer case.

5.2.3. Check oil level transfer case



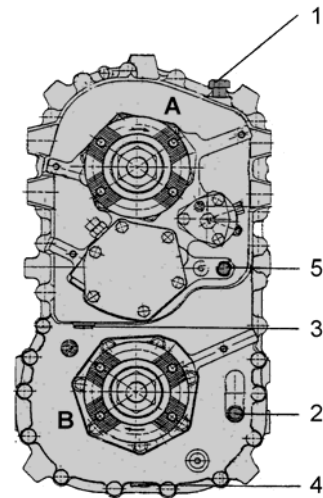
Check the oil level of the transfer case every two months at normal working conditions.



To prevent measuring faults: Do not check the oil level when the transfer case is hot. The oil temperature must be below 40°C (104F).

Drive shaft (A) is the inlet shaft and drive shaft (B) drives axles 2 and 3. (Picture 5-5)

1. Make sure the truck stands on a horizontally flat base.
2. Unscrew the plug from the filler hole (2). (Picture 5-5)
3. The oil level should be at the rim of the filler hole. If not, fill it up through the filler hole (2).
4. Reinstall the plug.



Picture 5-5

5.2.4. Transfer case oil change



Change the oil of the transfer case every year during the yearly maintenance service at normal working conditions.



Caution!

The transfer case and oil are hot after driving the truck for a while.

1. Make sure the truck stands on a horizontally flat base.
2. Put a trough under the drain plugs.
3. Unscrew the drain plugs (3 and 4). (Picture 5-5)
4. Clean the drain plugs and renew the seals.
5. Reinstall the plugs after draining the oil.
6. Remove the plugs from the filler holes (2 and 5).
7. Fill the transfer case with approx. 6.5 liter oil through the filler holes till the oil level reaches their rims.
8. Reinstall the plugs of the filler holes with renewed seals.

5.3. Axles

All axles are Kessler & Co axles.

Axle number	Steered	Driven	Differential	reduction
Axle 1	Yes	No	-	-
Axle 2	Yes	Yes	Single	6,35
Axle 3	No	Yes	Lead-through	6,35
Axle 4	Yes	Yes	Single	6,35

5.3.1. Main tenance axles



Check the hubs and differentials of axle 2, 3 and 4 every two months for leakages and filth on the breathers.



Make sure no water penetrates through the breathers by using a high pressure cleaner. This could cause serious damage to the hubs and differentials.

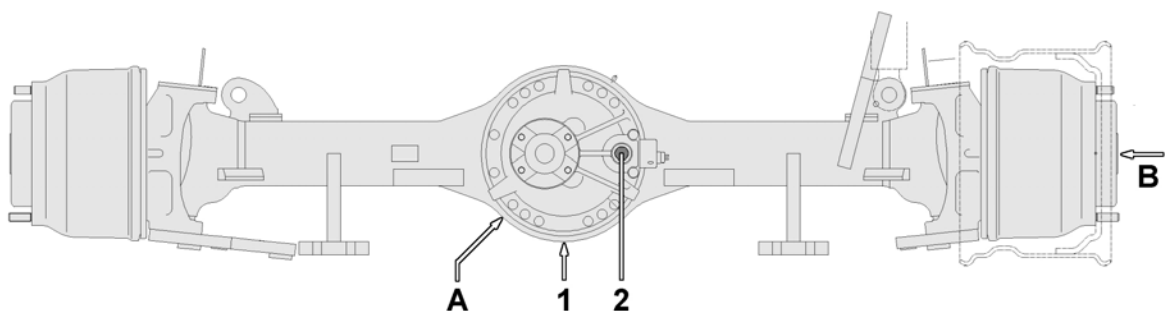
5.3.2. Check oil level differentials



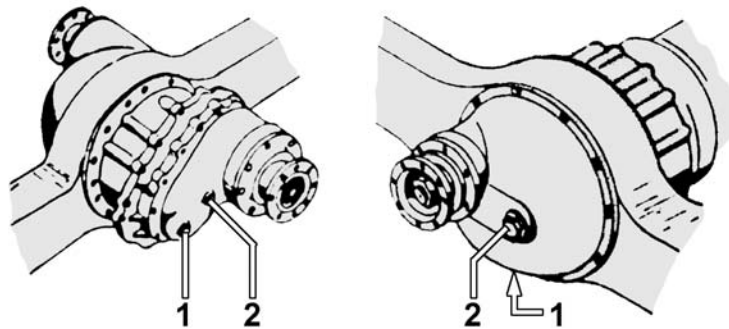
Check the oil level of the differentials every two months at normal working conditions.



To prevent measuring faults: Do not check the oil level when the differentials are hot. The oil temperature must be below 40°C (104°F).



Picture 5-6, model with single differential



Picture 5-7, model with feed-through differential

1. Make sure the truck stands on level ground.
2. Unscrew plug (2) from filling hole in differential (A) (Picture 5-6 and Picture 5-7).
3. If the oil level is not just below filling hole edge, top up oil through filling hole (2).
4. Reinstall the plug.

5.3.3. Differential oil change



Change the oil in the differentials every year during the yearly maintenance service at normal working conditions.



Caution!

The differentials and oil are hot after driving the truck for a while.

1. Make sure the truck stands on level ground.
2. Put a trough under the oil drain point.
3. Unscrew drain plug (1) (Picture 5-6 and Picture 5-7).
4. Clean the drain plug and provide it with a new seal ring.
5. Remount the drain plug and unscrew plug (2) from the filling hole.
6. Fill the driven axles through the filling hole to the edge with oil.

5.3.4. Check oil level hubs



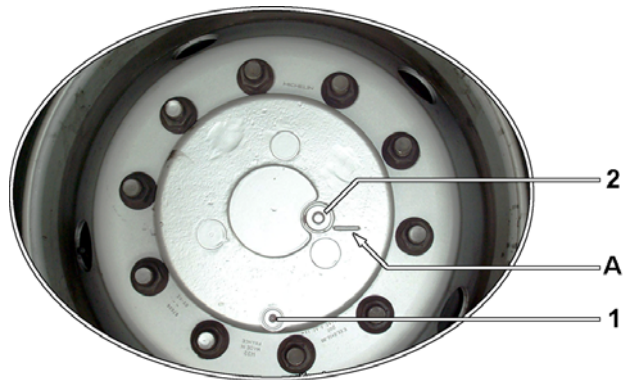
Check the oil level of the hubs every two months at normal working conditions.



To prevent measuring faults: Do not check the oil level when the hubs are hot. The oil temperature must be below 40°C (104F).

The axle hubs (B) of axles 2, 3 and 4 are filled with oil (Picture 5-6).

1. Make sure the truck stands on level ground.
2. For the gauging filling line (A) must be level and drain plug (1) must be at the bottom (see Picture 5-8).
3. Unscrew the plug (2) from the filling hole.
4. If the oil level is not just below filling hole edge, top up oil through filling hole (2).
5. Reinstall the plug.
6. Do this for all six axles hubs.



Picture 5-8

5.3.5. Hubs oil change



Change the oil of the hubs every year during the yearly maintenance service at normal working conditions.



Caution!

The hubs and oil are hot after driving the truck for a while.

1. Make sure the truck stands on level ground.
2. For the gauging filling line (A) must be level and drain plug (1) must be at the bottom
3. Put a trough under the drain point.
4. Unscrew drain plug (1).
5. Clean the drain plug and provide it with a new seal ring.
6. Reinstall the drain plug and unscrew plug (2) from the filling hole.
7. Fill the driven axles through the filling hole to the edge with oil.

5.4. Tires

5.4.1. Main tenance tires



Check the tires rims every week at normal working conditions.

To ensure safety, all tires and rims must be checked regularly for wear and damages. This has to be done on the outside as well on the inside of the wheels. To get better access, turn the wheels entirely to the left or right using the steering wheel.

5.4.2. Tire pressure



Check the tire pressure every two months at normal working conditions.

Check all tires for a tire pressure of **9 bar**.
Correct this if necessary.

5.5. Check the brake lining thickness



Check the brake lining thickness every year during the yearly maintenance service at normal working conditions.

At the rear of every brake drum you can check if the brake lining has the required strength for safe operation. The brake lining must be replaced if it is worn to the wear ring, which you will find on the lining side.

5.5.1. Brakes

We advise to test the brakes every year on a brake tester.

5.6. Clutch



Check the clutch every year during the yearly maintenance service at normal working conditions.

5.6.1. Checking the clutch

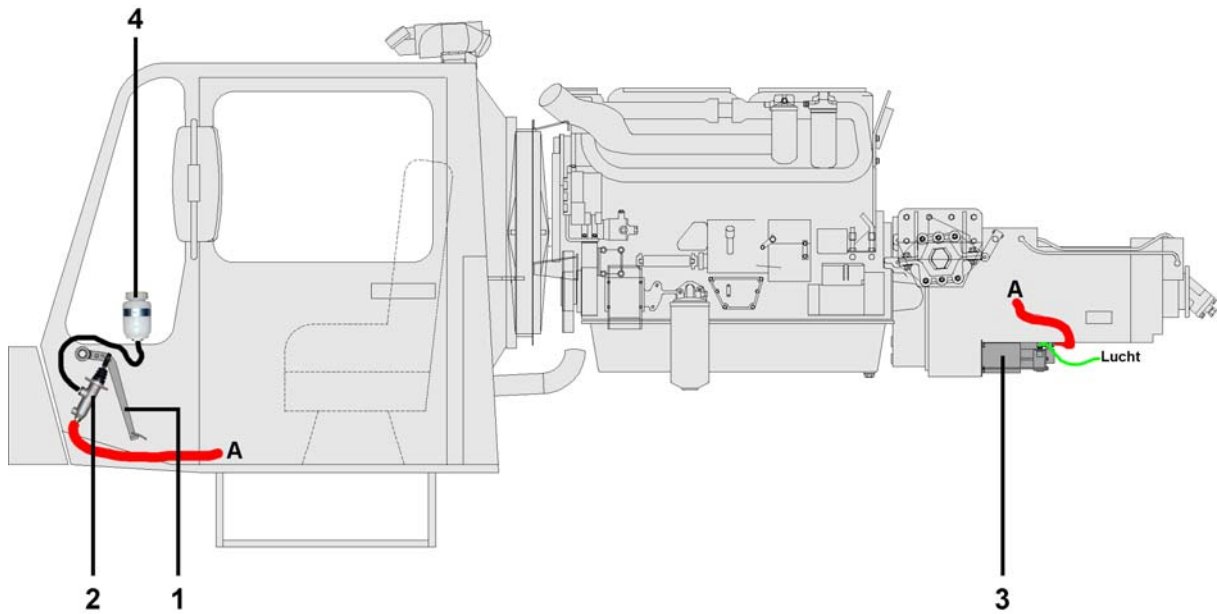
1. Press the clutch pedal a few times completely in.
2. It is necessary to vent the clutch when the clutch feels "spongy".
3. Feels the clutch "hard", driving gives no problems.

5.6.2. Venting the clutch



Caution!

During venting the clutch fluid level must stay above the minimum level.



Picture 5-9

1. Be sure the engine is turned off.
2. Vent the 10 litre accessories tank.
3. Person 1: Press the clutch pedal for 2/3. (Picture 5-9, 1 and 2)
4. Person 2: Vent the clutch by opening the vent nipple. (The vent nipple is located on the cylinder beneath the clutch housing.) (See Picture 5-9, 3 and Picture 5-10, B)



Picture 5-10

5. When the clutch feels "hard" close the vent nipple.
6. Fill up the clutch fluid tank with clutch fluid.



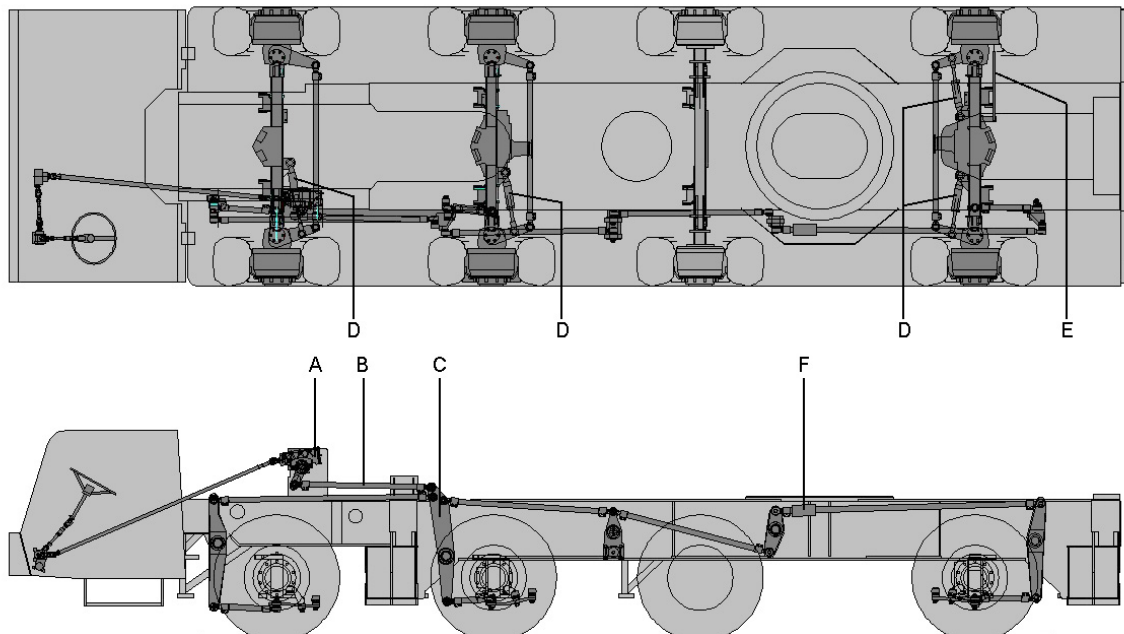
5.6.3. Clutch fluid change



Change the clutch fluid every two years at normal working conditions.

1. Be sure the engine is turned off.
2. Vent the 10 litre accessories tank.
3. Place a drainage hose onto the vent nipple (*B*, *Picture 5-10*) of the cylinder (3). (Beneath the clutch housing)
4. Open the nipple by turning it half a stroke.
5. Pump all the fluid out of the system by means of the clutch pedal (*1 en 2*) until no fluid comes out of the vent nipple.
6. Fill up the reservoir (4) with new clutch fluid and pump it in the system by means of the clutch pedal.
7. Keep pumping and filling until clean clutch fluid appears at the vent nipple.
8. Close the vent nipple and remove the drainage hose.
9. Fill up the reservoir if necessary. The fluid level in the reservoir should always be above the minimum mark

6. Steering system



Picture 6-1

- A) Steering housing
- B) Steering rods
- C) Steering arms
- D) Hydraulic auxiliary steering cylinders
- E) Emergency cylinder

Picture 6-1 shows how the steering system is built.

The turning motion of the steering wheel is mechanically converted to the motion of the steering rods. These in turn operate the steering arms, whereas the 4th axle steers opposite compared to the first and second axle. This provides a small turning circle.

6.1. Check the steering system



Check the play of the steering arms, ball joints, steering housing (bolts) and steering rods every two months.

1. The crane must be fully folded.
2. Person 1: Wiggle the steering wheel to the left and right.
3. Person 2: Check the play of the steering arms, ball joints, steering housing (bolts) and steering rods.
4. Repair if necessary.

6.2. Align the steering system



To prevent excessive tire wear, align the steering system every year during the maintenance service.

All play in the steering system must be checked before aligning it.

Please contact Spierings Cranes for instructions.



7. Electrical system

The on-board voltage is 24 volt. It is supplied by two 12 volt/165Ah batteries, series connected. They are charges by a 24V alternator with a maximum charging current of 35A.

With the battery switch next to the battery box, the truck's electrical circuit can be cut off. It must be done in case of welding jobs and when the crane is parked for a longer period of time.

On the co-drivers side in the dashboard, a print with fuses and relays is situated. Even so are some electrical components situated under the middle console.

In the enclosures you will find all electrical diagrams.

7.1. Lighting



Check the lighting of the truck every day before driving off and during the yearly maintenance service.

Replace a lamp as soon as possible when the lamp is dead or when the lamp shines too bright. Do this to guarantee optimal safety.

7.2. Dashboard lighting



Check the dashboard lighting every day before driving off and during the yearly maintenance service.

Check the dashboard lighting for broken indicator lamps. Replace as soon as possible to prevent serious damage of the vehicle.

7.3. Batteries

7.3.1. Check the batteries



Check the batteries of the truck every two months.



Caution!

Battery acid is harmful for human and environment. Be very careful with it!

The batteries must be checked on the following points:

- Is the fluid level still acceptable (Fill it up with distilled water when necessary)
- Is there no cable wear
- Are the battery clamps still attached on the right way
- Are the batteries still attached on the right way
- Do the batteries need to be recharged

7.3.2. Recharging the batteries



Caution!

Never recharge the batteries of the truck by means of the superstructure engine batteries. The superstructure engine batteries could discharge also. Especially during winter time.

You need a charging device and a charging cable for recharging the batteries.

If you use a quick-charger, all battery cables must be disconnected in order to prevent damage to electronic components.

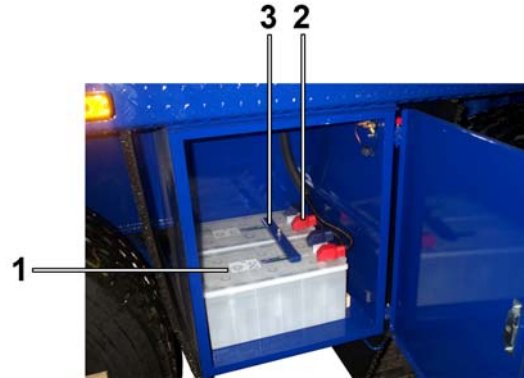
1. Be sure the engine is not running. (Remove the ignition key from the ignition slot)
2. Connect a NATO-cable on the truck and the charger.
3. Switch on the charger device.
4. First switch off the charger device after charging the batteries.
5. Remove the cable.
6. Start the engine and leave it for several minutes.



7.3.3. Replacing batteries

We advise to replace the batteries when the engine will start difficulty. (The batteries must be fully recharged.) Use new batteries with the same brand and dimensions.

1. Be sure the engine is not running. (Remove the ignition key from the ignition slot)
2. First remove the battery clamp (2) at the “-” poles. Next those on the “+” poles. (*Picture 7-1*)
3. Remove the battery-holder (3).
4. Remove the old batteries (1) and place the new ones.
5. Reinstall the battery-holder.
6. First connect the battery clamp at the “+” poles. Next those on the “-” poles. (Be sure to tighten them well)
7. Use Vaseline to grease the poles.
8. Start the engine and leave it for several minutes.



Picture 7-1

8. Hydraulic system

8.1. Check oil level hydraulic tank



Check the oil level of the hydraulic tank every two months at normal working conditions.



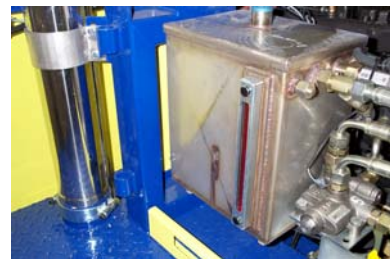
To prevent measuring faults: Do not check the oil level when the oil is hot. The oil temperature must be below 40°C (104F).

1. Make sure the truck stands on a horizontally flat base.
2. Check the gauge (2) of the oil tank (1). The oil level must be at approx. 80% of the gauge. (Picture 8-1)
3. If necessary fill up the tank with hydraulic oil through the filler hole (3).
4. Always use hydraulic oil of the same brand and type. (Consult Spierings Kranen in case of doubt).



Picture 8-1

Below the engine cowling near the steering housing is another tank situated. (Picture 8-2) This tank is hydraulically supplied with oil by the hydraulic pumps and is therefore always full. The surplus on oil will be returned to the main tank. The oil level of this tank does not need to be checked.



Picture 8-2

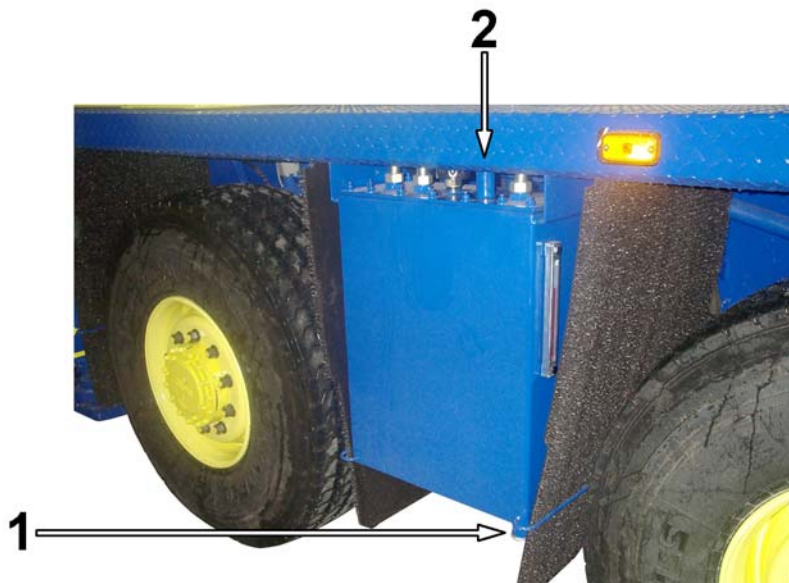
8.2. Hydraulic oil change



Change the hydraulic oil every 5 years after analysis.

First analyze an oil sample before changing the oil. When oil change is necessary all hydraulic cylinders (including the suspension cylinders) must be retracted.

1. Unscrew the filling cap (2) from the oil tank (*Picture 8-3*)
2. Put a trough under the drain plug (1).



Picture 8-3

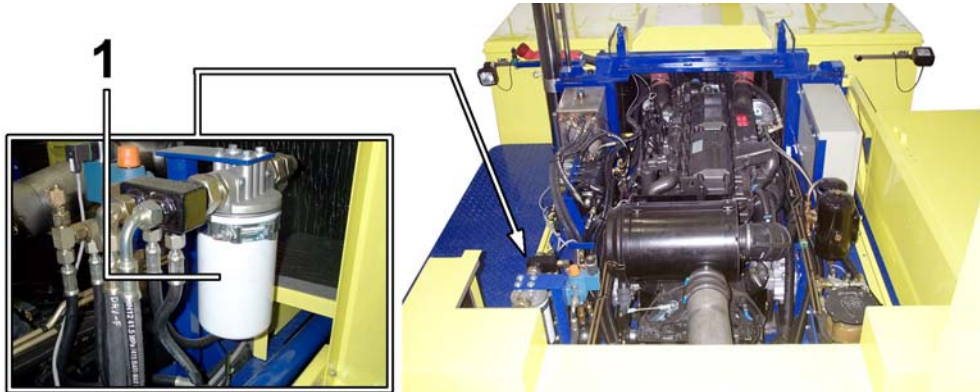
3. Remove the drain plug and drain the oil out of the tank.
4. Reinstall the drain plug with a renewed seal.
5. Fill the hydraulic tank with 95 liter oil through the filler hole.
6. Start the engine and approx. 20 liters of oil will be pumped to the oil tank near the steering housing. The gauge on the main hydraulic tank indicates an oil level of $\pm 80\%$.

8.3. Hydraulic return filter change



Change the hydraulic return filter every year during the yearly maintenance service at normal working conditions.

8.3.1. Hydraulic return filter



Picture 8-4

The return filter can be found under the left engine cowl as indicated in *Picture 8-4*.

1. Use a filter wrench to remove the return filter.
2. Coat the sealing ring with oil.
3. Place the new filters onto the filter holder manually. Do not use a wrench.
4. Switch on the engine for a few minutes.
5. Check the oil level by looking at the gauge and fill up when necessary.
6. Check for leakages.
7. Reinstall the left engine cowl.

8.4. Check the suspension's accumulators



Check the suspension's accumulators every year during the yearly maintenance service at normal working conditions.

The suspension system of the AT4 has eight accumulators. All are mounted on the hydraulic suspension cylinders of every axle. You need a special tool of HYDAC to check the accumulators. The pressure must be 110 bar.



8.5. Hoses and connections hydraulic system



Check all the components of the hydraulic system for leakages and damages every two months.

All hoses, connections, hydraulic blocks, filters, cylinders and oil tank must be checked regularly for damages and leakages. Replace the part as soon as possible to prevent serious damage.



9. Pneumatic system

The pneumatic system consists of a primary system and a secondary system.

- The primary system is for the brakes of the truck (approx. 9,8 bar)
- The secondary system is for the accessories (approx. 7 bar)

A compressor mounted on the engine delivers the air pressure.

Further is the system secured by a four-circuit safety valve. If one circuit has a leakage, this valve sees to it that the remaining circuits keep air pressure.

9.1. Primary system: brake system

Relay valves are the foundation of the braking system. Control lines from the brake pedal valve and parking brake valve operates the relay valves. When operated, the valves activate the brake boosters by means of the feeder lines.

The braking system consists of three air vessels:

- Vessel 1 (60 liter)
Activates the (working)brake boosters of axle 1 and 2.
- Vessel 2 (60 liter)
Activates the (working)brake boosters of axle 3 and 4.
- Vessel 3 (40 liter)
Activates the parking brake boosters of axle 2 and 3.

The parking brake activates by venting the boosters.

9.2. Secondary system: accessories and gearbox

A secondary system is present to control all pneumatic components of the drive system.

This system needs its own 10 liter vessel. To extend life of the valves a pressure reducer with water separator and air lubricator is mounted.

The pressure reducer is adjusted for 7 bar.

The secondary system consists of two air vessels:

- Vessel 4 (10 liter)
Controls all secondary components (accessories).
- Vessel 5 (5 liter)
An emergency vessel for the clutch. When the air pressure in the secondary system fails, changing gears is still possible a few times.

Components activated by the secondary system:

- Gear box: - Controlling various functions gear box
- Engine brake: - Shut off the exhaust valve
- Switch of fuel pump
- Transfer case: - Switch off high/low gearing
- Switch off longitudinal differential lock
- Axles: - Switch off transverse differential lock axle 2, 3 and 4

9.3. Air dryer

To extend life of all components and guarantee there operation, the pneumatic system consist of an air dryer.

9.3.1. Air dryer filter change



Change the air dryer filter every two years at normal working conditions.

The air dryer is mounted on the right hand side below the engine cowling next to the 5 liter air vessel. (Picture 9-1)

- Remove the right hand side cover plate from the engine cowling.
- Remove the air dryer filter (1) by means of a filter wrench.
- Coat the sealing ring of the new filter with oil.
- Place the new filters onto the filter holder (1) manually. Do not use a wrench.
- Switch on the engine for awhile and check for leakages.
- Reinstall the cover plate.



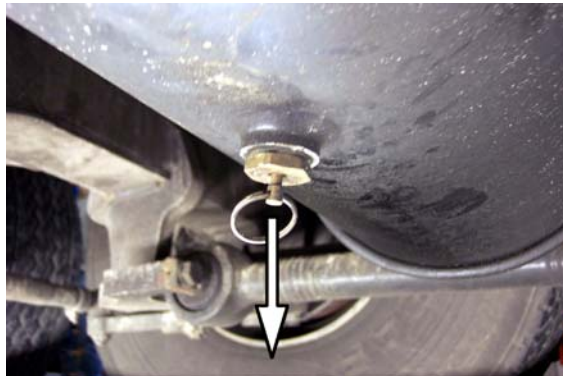
Picture 9-1

9.4. Air vessels



Check the air vessels every week for the presence of condensate water.

Check the air vessels for condensate water by pulling or pushing the drainage valve mounted underneath the vessels. When there is regularly condensate water found, change the air dryer filter. (See 9.3.1 Air dryer filter change)



Picture 9-2

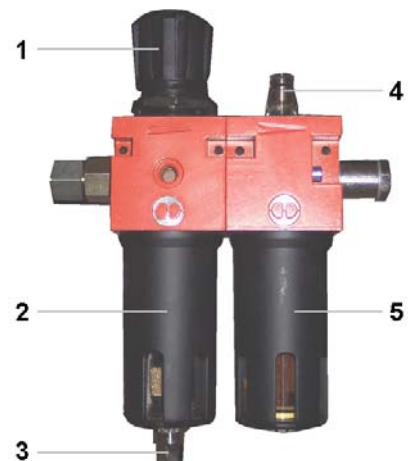
9.5. Air lubricator/water separator



Check the level of the air lubricator and drain the water separator every two months at normal working conditions.

The air lubricator/ water separator is shown in *Picture 9-3* and consist of the following components:

1. Pressure reducing valve
2. Water separator
3. Water separator drain valve
4. Control screw air lubricator
5. air lubricator



Picture 9-3

9.5.1. Refill air lubricator

1. Make sure the diesel engine is not running.
2. Unscrew the bowl (5) and top up with oil.
3. Reinstall the bowl with oil.
4. Eventually adjust the amount of lubrication by means of the control crew (4).

9.5.2. Water separator

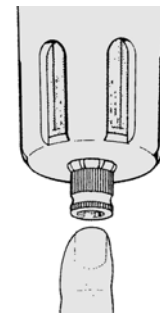
The water separator works normally semi-automatic.

When there is pressure on the air system, the valve at the bottom of the water separator is closed and the water of condensation collects in the holder.

When there is no pressure on the air system, the valve at the bottom of the water separator opens and drains the water of condensation.

Manually press the valve upwards to drain the water of condensation.

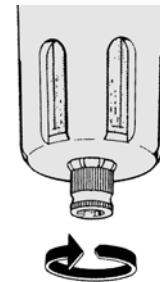
(Picture 9-1)



Picture 9-1

To close the valve permanently, turn the valve to the right.

(Picture 9-2)



Picture 9-2

To clean or replace the filter element, unscrew the bolt of the filter element using a special tool. (Picture 9-3)



Picture 9-3

The secondary air circuit pressure can be set with pressure reducing valve knob (1, Picture 9-3).



9.6. Check brake pressure



Check the brake pressures of all axles every year during the yearly maintenance service.

An inspected pressure gauge must be attached to the brake boosters in order to measure its pressure. Turn on the engine and activate the brake pedal valve.

- Pressure brake boosters of axle 1 and 2: 7,8-9,8 bar
- Pressure brake boosters of axle 3 and 4: 7,0 bar

If necessary adjust the pressures by means of the pressure reducing valves mounted in the feeder lines.

Also check the pressure of the system. Attach a pressure gauge to one of the 60 liter vessels. The system pressure must be 9,8 bar. If not, adjust the pressure by means of the overpressure valve mounted on the air dryer.

9.7. Hoses and connections pneumatic system



Check all components of the pneumatic system every two months for leakages and damages.

All hoses, connections, pneumatic valve blocks, filters, cylinders and air vessels for leakages and damages. If necessary replace the component as soon as possible to prevent serious damage.

10. Lubrication

10.1. Central lubrication system (Option)



Check all the lubrication points of the central lubrication system every 2 months. Also check the grease reservoir for sufficient grease.

Joints, hinges and bearings must be lubricated regularly. A central (automatic) lubrication system is therefore used. Nevertheless all grease points must be checked for sufficient grease. If not, damage is the result.

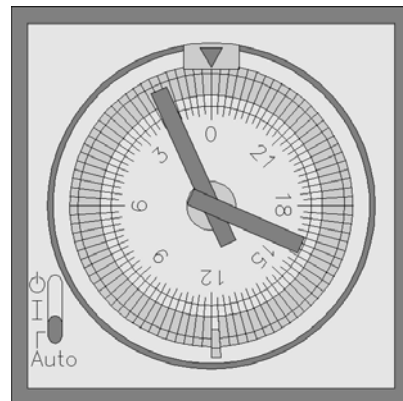
10.1.1. Timer central lubrication system

The central lubrication system is controlled by a timer on which the grease time in relation to the operating time can be set. (Picture 10-1)

The timer must be set in such a way that 24 hours of operation are followed by 15 minutes greasing. To do this one clock slide must be extended.

When the timer is set to "Auto" or "A" the timer starts functioning. If extra greasing is needed, the grease pump can be operated by setting the timer to "I". The timer must be set to "Auto" after 15 minutes.

The central lubrication system timer is in the centre console at the co-driver's side.



Picture 10-1

10.1.2. Grease reservoir central lubrication system

The grease pump with reservoir is mounted on the right hand side of the engine compartment. (Picture 10-2)

For checking the grease level and topping it up the right handed cover plate must be removed.

The grease level must be above "min.". If not, fill it by means of a grease gun through the respective grease nipple.

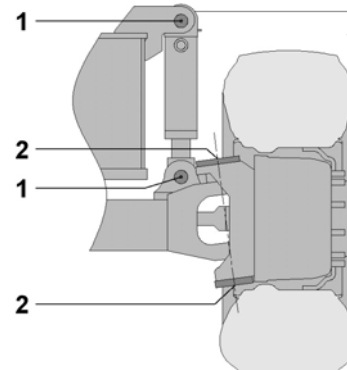
Use grease according the specifications in the chapter "Technical data".



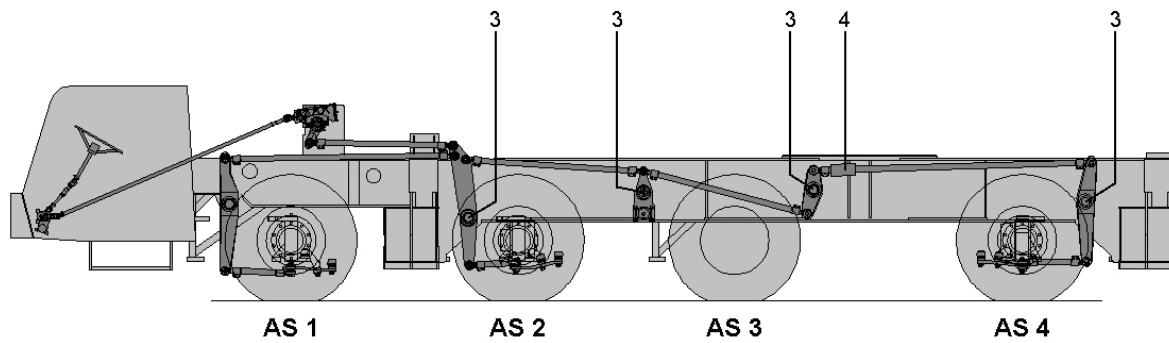
Picture 10-2

10.1.3. Greasing points central lubrication system

1. Pin joints (1) suspension cylinders above and below. (Picture 10-3)
2. Hubs (2) above and below (Except axle 3)



Picture 10-3



Picture 10-4

3. Pin joints steering arms (3)
4. Spring-loaded rod (4)

10.2. Manual lubrication



The grease interval for all manual greasing points is 2 monthly.



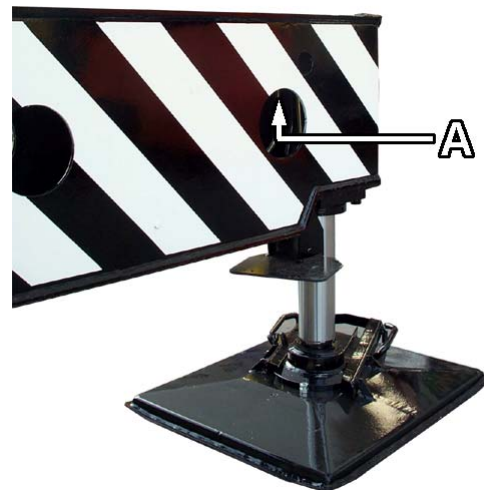
When not chosen for the central lubrication option, the lubrication points mentioned in chapter 10.1.3. should be manual lubricated too.

Use a grease gun or brush with EP2 grease for manual lubrication.

10.2.1. Outrigger beam cylinders

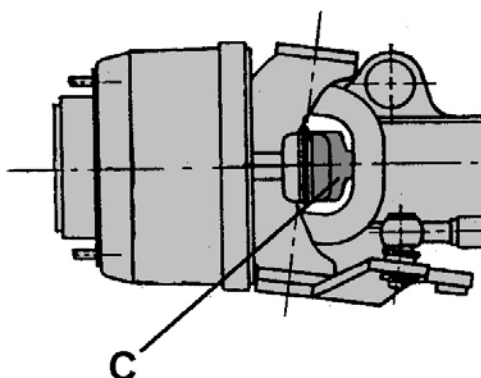
In *Picture 10-5* is shown the position of the grease nipple of the cylinder inside the outrigger beam. (A)

Extend the outriggers to reach the grease nipples through the holes. (1 nipple per outrigger beam)



Picture 10-5

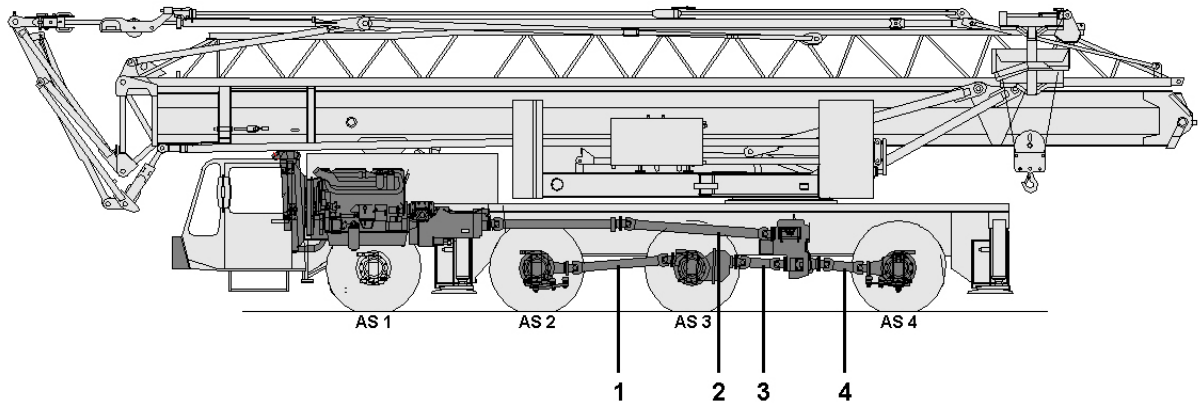
10.2.2. Driven axles



Picture 10-6

Grease all universal joints manually shown in *Picture 10-6, C*.

10.2.3. Cardan shafts



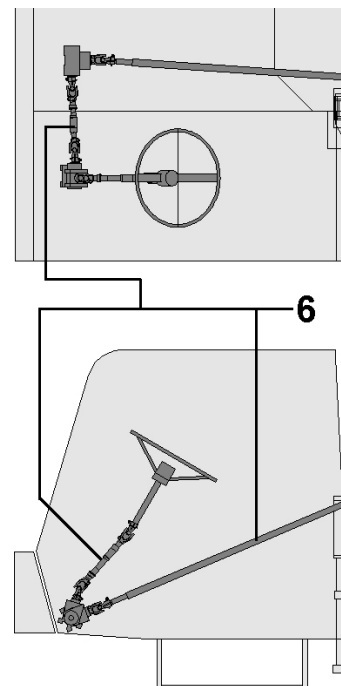
Picture 10-7

1. Cardan universal joints gear box
2. Cardan universal joints axle 2
3. Cardan universal joints axle 3
4. Cardan universal joints axle 4

10.2.4. Steering system

The various steering rods ball joints are maintenance-free. Only the steering rod spline bushings must be manually lubricated. (Picture 10-8, 6)

Also check the play of all joints and connections of the steering system.



Picture 10-8

10.2.1. Tower supports

The tower supports are located behind the cabin on top of the motor cowling. (See *Picture 10-9*)
Grease the supports with EP2 by means of a brush.



Picture 10-9



11. Various

11.1. Window washer fluid



Check the window washer fluid level every week.

11.2. Fire extinguisher



The fire extinguisher must be inspected every year by an acknowledged instance.



12. Technical data

Diesel engine		Spierings nr.
Motor oil	SAE 15W40 ACEA E4-98	
Oil filter	DAF nr. 1397765	SERV01150065
V-belt water pump-, fan- and alternator drive (2x)	DAF Nr. 1393365	-
V-belt tension measuring tool single-belt	Krikit I (DAF Nr. 1240442)	
V-belt tension measuring tool Twin-belt	Krikit II (DAF Nr. 1240443)	
Coolant	SAE-J-1034 of ASTM D 3306 (COOLELF PLUS 37°C)	OLSM00100080
Air dryer filter	DONALDSON P77-7409	SERV03100070
Water separator	DAF nr. 1296851	SERV04300010
Fuel filter	DAF nr. 1450184	SERV01150085
Nozzle special tools	DAF Nr. 1329309 en 0694928	
Gear box		
Oil gear box (At delivery)	SAE 15W40 ACEA E4-98	
Oil gear box (During maintenance by Spierings)	ELF: TRANSELF SYNTHESSE FE 75W90	OLSM00100120
Clutch fluid	Clutch fluid DOT 4 ELF: Frelub 650	OLSM00300010
transfer case		
Oil transfer case (At delivery)	SAE 80W90 API GL5/MIL-L-2105D	
Oil transfer case (During maintenance by Spierings)	ELF: TRANSELF SYNTHESSE FE 75W90	OLSM00100120
Seal oil drain plug	D.ring-A22x27-Cu DIN 07603	
Axles/brakes/tires		
Oil axles (At delivery)	ELF: TRANSELF SYNTHESSE FE 75W90	OLSM00100120
Oil axles (During maintenance by Spierings)	ELF: TRANSELF SYNTHESSE FE 75W90	OLSM00100120
Brake-shoes truck	-	-
Tires	445/65 R22.5	AACA01100020
Tire pressure	9 bar	
Rims	22,5" x 14"	AACA01100030
Hydrauliek		
Oil hydraulics	ATF Dexron-IID, -IIE, -III of Mercon-M (±100 liter) (oa. ELF Elfmatic G3 22051)	OLSM00100040
Oil return filter	CS-15AN	SERV04100211
Diversen		
Grease (Manual lubrication)	EP2 (oa. AVIA Mystiek JT-6)	OLSM01500030
Grease central lubrication system	EP2 (oa. AVIA Mystiek JT-6)	
Oil air lubricator	ISO/UNI FD22 (oa. Berulit 75)	OLSM00400010



13. Enclosures

Enclosure 1

Hydraulics

Enclosure 3

Electrical diagrams

Enclosure 4

Electrical connections

Enclosure 5

Lubrication