



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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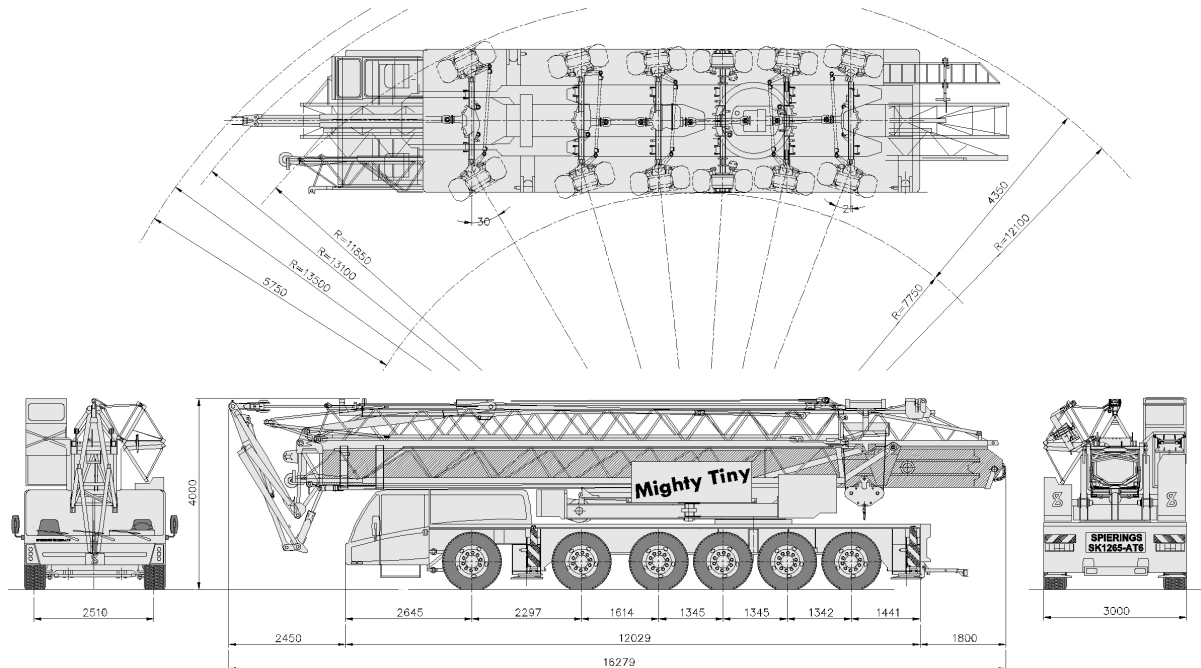


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1. General data AT6

The AT6-truck is especially designed for the Spierings SK1265 folding crane. Extra attention was paid to a smooth and comfortable transport to the work site. The crane is suitable for driving on public roads fully fitted with counterweight and tools. The chassis is an especially rigid structure to create a good crane support.

Picture 1-1 shows the measurements of the SK1265 with AT6-carriage. It states the overall dimensions, axles distances and turning circle.



Picture 1-1

Measurements

- length: 15,5m
- Width: 3m
- Height: 4m

Drive system

- 12.6 ltrs DAF diesel engine with turbo compressor and intercooler (type XE-390C1).
- ZF automatic transmission retarder; sixteen forward gears and one reverse gear.
- STEYR transfer case with a high (road) and a low (all-terrain) drive.
- Electronic accelerator pedal "E-gas" with speed control.
- Six Kessler & Co axles, where axle one, two, three and six are driven.

Steering:

- Axle 1, 2, 3, 5 and 6 are steered.
- Axle 5 and 6 are steered in opposite direction of axle 1, 2 and 3 to reduce the turning circle.



- Axle 5 and 6 can be disengaged. The axles may be steered in the same direction as the 3 front axles either by means of a steering knob or fully automatic. This way you can drive in crab steering mode.
- The 2-circuit steering system is hydraulically powered by means of a 2-circuit steering gear housing and 3 auxiliary cylinders.
- The steering system is fitted with an emergency steering pump, so in case of a defect in the main steering pump or stalling of the diesel engine, the truck remains steerable until it stands still.
- Provisions for driving off the road:
 - adjustable axle height
 - transfer case can be shifted in all-terrain gear
 - longitudinal and transverse differentials can be locked

Suspension:

- Hydro-pneumatic suspension.
- Suspension can be blocked.

Brakes:

- Pneumatic operated brakes.

4-point outrigger support:

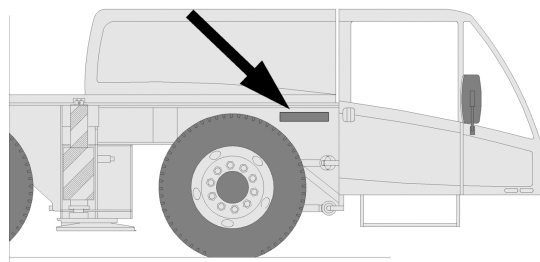
- Wide: 7.95m x 7.66m
- Narrow: 7.95m x 5.72m

Other data:

- Maximum speed limited to 85 km/h.
- Minimum speed at 1250 rpm: 1.9 km/h (is 32 m/min)
- Truck weight incl. superstructure approx. 72,000 kg
- The axle load is 12,000 kg each axle.

Numbers:

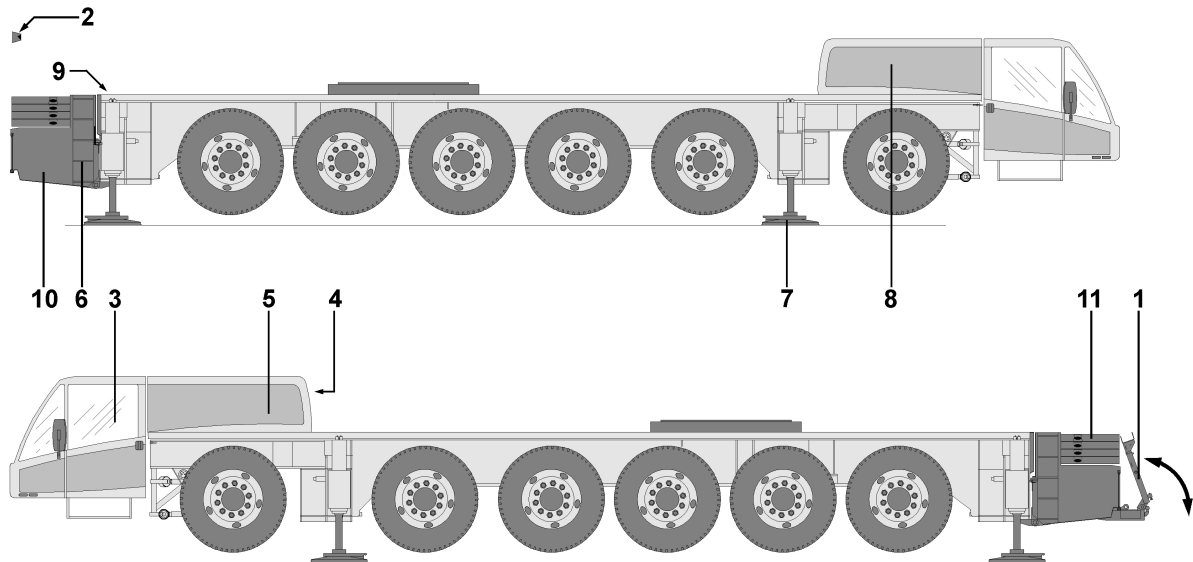
- Engine number: at the left on the engine block above the fuel pump.
- Vehicle identification number: on the ID-plate in the co-driver's legroom (see *Picture 1-2*) and engraved in the right-hand frame girder in front of the 1st axle (see *Picture 1-3*).

*Picture 1-2**Picture 1-3*



2. Operation

2.1. Getting to know the truck



Picture 2-1

1. Bumper

If desired a bumper can be mounted, which enables you to take along an extra sling box or spare wheel. When the bumper is folded up, the tow hook can be used.

2. Rear and side view cameras

To broaden your view at the rear and right-hand side of the truck cameras are installed. A monitor in the cab shows the views.

3. Truck cab

Besides driving the crane, with the control panel in the truck cab the crane can be supported on outriggers and the axle height can be adjusted.

4. Work lamps

At the rear of the engine compartment work lamps are mounted at the right-hand side as well as at the left-hand side. They can be operated from the cab.

By loosening knob (A) on the bracket the lamp can be adjusted further (Picture 2-2).



Picture 2-2



5. Left engine cowling

At this side under the engine cowling you will find the following parts:

1. Electrical cabinet
2. Button box
3. Grease reservoir central lubrication system
4. Ladder
5. Oil top up pipe



Picture 2-3

6. Ladder

Via the ladder at the back of the truck you can mount the truck frame. The ladder inside the left engine cowling can also be used for this purpose.

Mind your safety.

7. Outriggers

At both sides of the truck there are 2 extending outrigger beams (4), and to each beam a hydraulically operated outrigger (1). These outriggers provide stability during hoisting operations. 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.

With a separate (remote) control box the outriggers can be radio controlled. Check to make sure the crane is level by using the levels.



Picture 2-4



8. Right engine cowling

Underneath the engine cowling at the right-hand side of the truck you will find the following parts:

1. Air filter
2. Combined cooler unit (Intercooler/radiator/oil cooler) with hydraulically driven fans.
3. Noise isolating wall



Picture 2-5

9. Fuel tank

The fuel tank is integrated in the frame at the rear end of the truck. The tank capacity is 600 ltrs and can be filled through the filler neck at the rear of the truck (Picture 2-6).



Picture 2-6

10. Rear box

The rear box contains both on the left as well as on the right and rear a lockable storage compartment. In the centre under the outrigger support plates you will find a sling box.

11. Outrigger support plates

On top of the rear box you can store four outrigger support plates. They can be put in operating position by means of a hoisting arm, which is mounted to the outer tower.



2.2. Truck 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.

The windows can be operated with the switches on the dashboard.

2.2.3. Wing mirrors

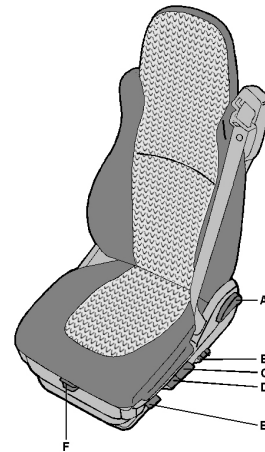
The wing mirrors may be adjusted by hand. Make sure the mirrors are adjusted before driving off, so that you have satisfactory view. The mirror heating can be switched on with a switch on the control panel.

2.2.4. Seats

The cab has room for the driver and a co-driver. The driver's seat has pneumatic suspension, the co-driver's seat does not. The seats' position can be adjusted. This should only be done when the vehicle stands still.

(See Picture 2-7).

- A) Back adjustment
- B) Lumbar support adjustment (pressing = inflate and pull = deflate)
- C) Height adjustment (pulling the handle = up and pushing it = down)
- D) Tipping the seat
- E) Handle fast lowering
- F) Seat adjustment



Picture 2-7

2.2.5. Safety belts

The seats are fitted with safety belts. Driver and co-driver must wear them while 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 lock 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. Storage 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. Also in the dashboard at co-driver's side you will find a storage compartment.

2.2.7. Sun 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. Fuse box

The fuse box is situated in the dashboard at co-driver's side. (Picture 2-8)



Picture 2-8

2.2.9. Reservoir windscreen washer fluid

It is found at the left of the co-driver's side.



Picture 2-9

2.2.10. Middle console

All components underneath the middle console at the co-drivers side can be reached by two covers. The next component can be found (Picture 2-10):

1. Timer central lubrication system
2. Display rear axle steering
3. Adjustment knobs for rear axle steering
4. Transfer case neutral (Used during towing the truck)
5. Reset button ABS-system
6. Switch off EMAS-system (rear axle steering)



Picture 2-10



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 drivers' side.



Picture 2-11

Every remote control comes with 2 batteries each.

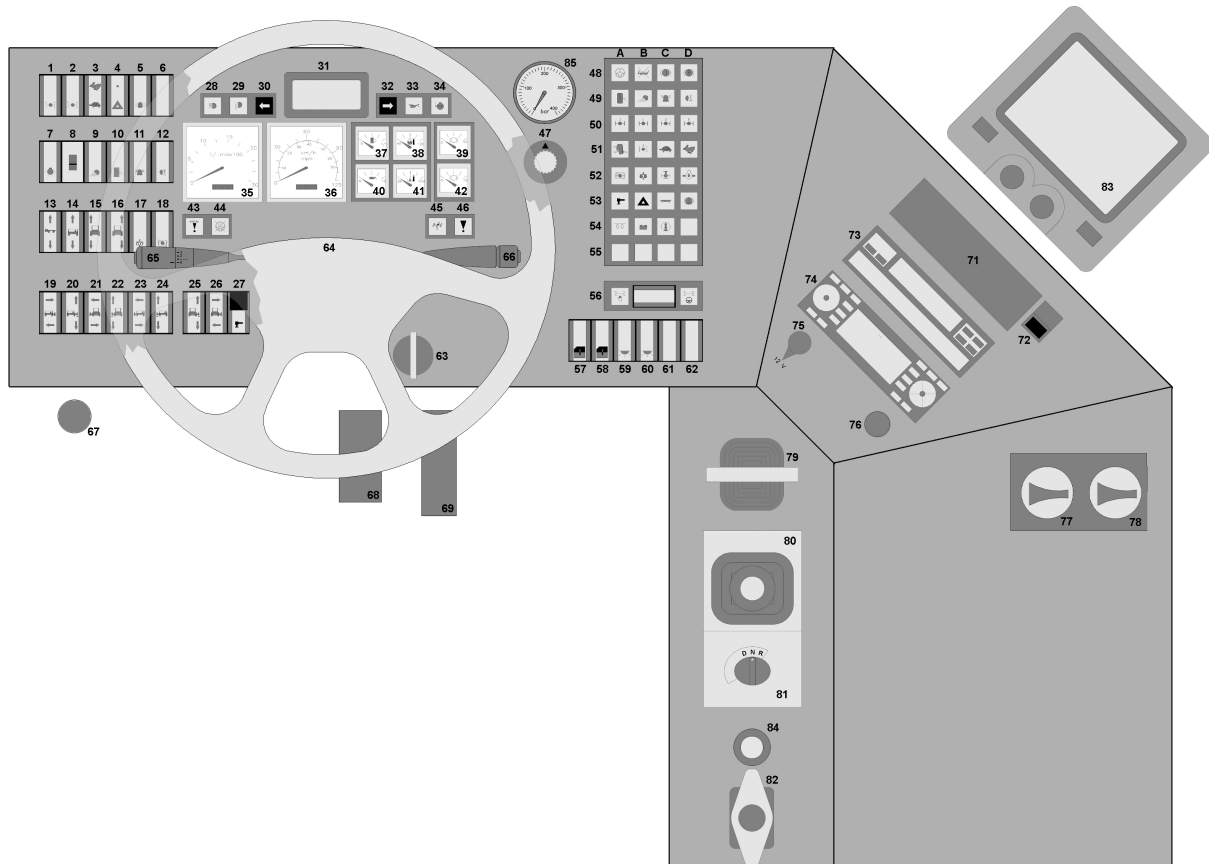
While the batteries are being charged, the indicator lamp lights. As soon as they are fully charged, the lamp starts flashing.

2.2.12. Fire extinguisher

The fire extinguisher is situated behind the co-driver's seat.

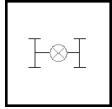


2.3. Control Panel



- | | | | |
|--|---|---|---------------------|
| 1. Longitudinal differential lock | 36. Mileage counter | 54. Indicator lamps | A) Pre-heating |
| 2. Transverse differential lock | 37. Fuel gauge | | B) Charging current |
| 3. Transfer case high/low | 38. Coolant temperature gauge | batteries | |
| 4. Switch alarm light | 39. Air-pressure gauge circuit 1 | | C) Air cleaner |
| 5. Aeronautical warning light | 40. Oil pressure gauge diesel oil circuit | | D) Blank |
| 6. Blank | 41. Oil pressure temperature circuit retarder | 55. A, B, C and D blank or not present | |
| 7. Light switch off/dipped beam | 42. Air-pressure gauge circuit 2 | 56. A) Rear axle disengaged manual steering | |
| 8. Dimmer dashboard lighting | 43. Indicator gear box (transmission) | B) Switch rear axle manual steering | |
| 9. Switch worklamps | 44. Steering system error announcement | C) Switch rear axle automatic steering | |
| 10. Switch mirror heating | 45. Error indicator electronic rear axle steering | D) Rear axle disengages automatic steering | |
| 11. Switch rotating beacons | 46. Error indicator diesel engine | 57. Door window left | |
| 12. Switch fog tail light | 47. Manual rear axle steering | 58. Door window right | |
| 13. Switch axles up/down | 48. Indicator lamps | 59. Interior lighting driver's side | |
| 14. Switch axles 1 and 2 up/down | A) Steering circuit 1 | 60. Interior lighting co-driver's side | |
| 15. Switch axles 3, 4, 5 and 6 left up/down | B) Steering circuit 2 | 61. Front axle-drive | |
| 16. Switch axles 3, 4, 5 and 6 right in/out | C) Air pressure | 62. Blank | |
| 17. Switch levelling | D) Parking brake | 63. Ignition switch | |
| 18. Switch driving/blocking | 49. Indicator lamps | 64. Steering wheel | |
| 19. Switch outrigger beam front left retract/extend | A) Mirror heating | 65. Control lever blinker/windscreen wiper interval | |
| 20. Switch outrigger front left retract/extend | B) Work lamps | 66. Control lever retarder/cruise control/ESC | |
| 21. Switch outrigger beam rear left retract/extend | C) Rota flare light | 67. Vacuum brake | |
| 22. Switch outrigger rear left retract/extend | D) Fog tail light | 68. Brake pedal | |
| 23. Switch outrigger beam front right-hand side retract/extend | 50. Indicator lamps | 69. Gas pedal | |
| 24. Switch outrigger front right-hand side retract/extend | A) Transversal lock axle 1 | 71. Navigation system | |
| 25. Switch outrigger beam rear right-hand side retract/extend | B) Transversal lock axle 2 | 72. Switch camera view rear/side | |
| 26. Switch outrigger rear right-hand side retract/extend | C) Transversal lock axle 3 | 73. Digital tachograph | |
| 27. Switch outrigger controls on/off | D) Transversal lock axle 6 | 74. Radio | |
| 28. Indicator lamp full beam headlight | 51. Indicator lamps | 75. 12V branch box | |
| 29. Indicator lamp dimlight | A) Long.lock transfer case | 76. Cigarette lighter | |
| 30. Indicator lamp winker left | B) Longitudinal lock axle 3 | 77. Temperature control cab heater | |
| 31. Display automatic transmission | C) Off-the-road gear | 78. Fan control | |
| 32. Indicator lamp blinker right | D) Road gear | 79. Parking brake | |
| 33. Indicator lamp oil pressure | 52. Indicator lamps | 80. Speed lever manual gear shifting | |
| 34. Indicator lamp coolant level | A) Axle blocking | 81. Selector switch transmission | |
| 35. Revolution counter | B) Levelling | 82. Battery switch | |
| | C) All-terrain mode suspen. | 83. Camera monitor | |
| | D) Maximum oil pressure suspension and outriggers | 84. Pressure control valve front wheel drive | |
| | 53. Indicator lamps | 85. general oil pressure gauge | |
| | A) Outrigger control | | |
| | B) Warning lights | | |
| | C) Aeronautical lamp | | |
| | D) Retarder | | |

Picture 2-12

**1. Switch longitudinal differential lock**

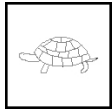
Switch on the longitudinal lock when, while driving off the road, you have no or little grip. The longitudinal locks will be locked.

**2. Switch transverse differential lock**

Switch on the transverse lock when, while driving with longitudinal lock, you still have insufficient grip. The differentials in the axles will be locked.

**3. Transfer case high/low**

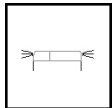
While driving on the road this switch must be on "high" (hare). The transfer case is in road travel mode.



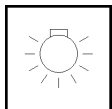
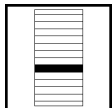
If you drive off the road you can put the switch on "low" (turtle). The transfer case is in all-terrain mode.

**4. Switch hazard warning light**

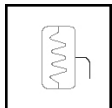
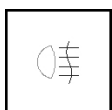
In case of emergency you can switch the hazard warning lights on and off with this switch.

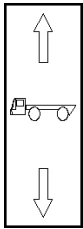
**5. Aeronautical warning light**

If you are working on or near an airport, you have to switch on this warning light.

**7. Switch dim light****8. Dimmer dashboard lighting****9. Switch work lamps**

This switch controls the work lamps left and right at the back of the truck cab.

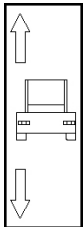
**10. Switch mirror heating****11. Switch rotating beacon****12. Switch Fog Tail Light**

**13. Switch all axles up/down**

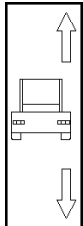
With this switch the cylinders of every axle are simultaneously extended or retracted (e.g. when operating the outrigger system).

**14. Switch axles 1 and 2 up/down**

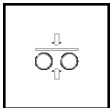
With this switch the cylinders of axles 1 and 2 can be extended or retracted simultaneously.

**15. Switch axles 3, 4, 5 and 6 left up/down**

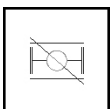
With this switch the cylinders at the left-hand side of the 3rd, 4th, 5th and 6th axle can be extended or retracted.

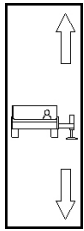
**16. Switch axles 3, 4, 5 and 6 right up/down**

With this switch the cylinders at the right-hand side of the 3rd, 4th, 5th and 6th axle can be extended or retracted.

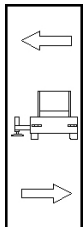
**17. Switch levelling**

E.g. to get all the axles at the same height for transport after outrigger operation, the axle cylinders must be levelled.

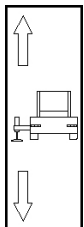
**18. Switch driving/blocking****19. Switch outrigger beam front left-hand side retract/extend**



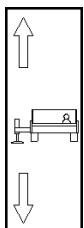
20. Switch outrigger front left-hand side retract/extend



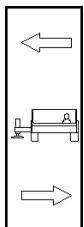
21. Switch outrigger beam rear left-hand side retract/extend



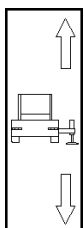
22. Switch outrigger rear left-hand side retract/extend



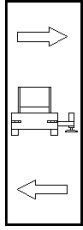
23. Switch outrigger front right-hand side retract/extend



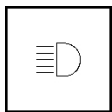
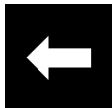
24. Switch outrigger beam front right-hand side retract/extend



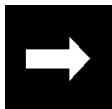
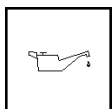
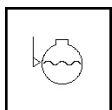
25. Switch outrigger rear right-hand side retract/extend

**26. Switch outrigger beam rear right-hand side retract/extend****27. Switch outrigger controls on/off**

Switch off the outrigger control when the outriggers are not being operated. Also switch it off while rigging up, rigging down or operating the crane. The remote control is also de-activated. Failing to switch off the controls means the crane can not be operated over the full operating range (full support base).

**28. Indicator lamp head light****29. Indicator lamp dim light****30. Indicator lamp blinker left****31. Display automatic transmission**

Indicates the automatic transmission mode.

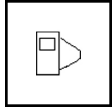
**32. Indicator lamp blinker right****33. Indicator lamp oil pressure diesel engine****34. Indicator lamp coolant level****35. Revolution counter**

The revolution counter is fitted with an hour counter. On this counter you can read the the number of operating hours of the diesel engine.

36. Mileage counter

The truck has a standard speed limiter (max. speed 85 km/h).

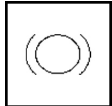
The total number of kilometres driven is shown on the counter at the bottom of the mileage counter display.

**37. Fuel gauge**

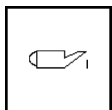
The fuel gauge only shows the amount of fuel in the tank when the ignition is switched on.

**38. Coolant temperature gauge**

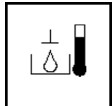
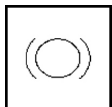
The diesel engine safety system is fitted with an overheating sensor for the coolant temperature. As soon as the temperature exceeds 110 °C, it activates the horn. The engine must be switched off immediately.

**39. Air-Pressure gauge circuit 1**

This shows the air pressure in operating brake circuit 1. When the pressure drops below 5.5 bar, indicator lamp 48C will light up. The crane must not be driven.

**40. Oil pressure gauge diesel oil circuit**

When starting this gauge will read approx. 5 bar. As soon as the oil is warm approx. 3 bar.

**41. Oil pressure temperature gauge retarder circuit****42. Air-pressure gauge circuit 2**

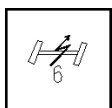
This shows the air pressure in operating brake circuit 2. When the pressure drops below 5.5 bar, indicator lamp 48C will light up. The crane must not be driven.

**43. Indicator transmission**

If the oil temperature gets too high while the retarder is switched on, you either have to gear down or set the retarder to a lower position or switch off the retarder. If you do not, this lamp will light up and a beeper sounds.

**44. Emergency steering circuit**

This lamp will light up when the vehicle stands still. When the lamp lights up during driving, the oil pressure in the emergency circuit drops too low. In this case STOP IMMEDIATELY!

**45. Error message electronic rear axle steering**

When the electronic rear axle steering stalls, the emergency cylinder will pull axles 5 and 6 in straight on position. You can drive on, however please note that the truck's turning circle is considerable wider. The defect should be remedied as soon as possible.

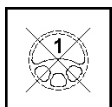
**46. Error indicator diesel engine**

The lamp is flashing:

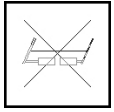
Stop the crane and switch off the engine to prevent damage to the vehicle and/or the engine.

The lamp burns continuously:

There is a malfunction because of which some functions do not operate correctly. Although you may drive on, the malfunction must be remedied as soon as possible.

**48. A) Main steering circuit**

This lamp lights up as soon as the oil pressure in the main steering circuit is too low. Have the malfunction repaired as soon as possible. If this lamp lights together with lamp 44: STOP IMMEDIATELY!

**48. B) Power steering circuit**

While the vehicle is standing still this lamp is always on as the oil pressure in the power steering circuit is too low. If this lamp is also on while driving, it means that there is no pressure building in the power steering circuit and the defect must be remedied as soon as possible.

**48. C) Air pressure**

If the air-pressure in operating brake circuit 1 or 2 falls below 5.5 bar, this indicator lamp will go on.

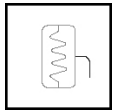
The crane must not be driven.

If this lamp is on after starting the engine:

Let the engine run idle until the air pressure rises above 5.5 bar. This lamp should go out.

**48. D) 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).

**49. A) Mirror heating**

Switch on the mirror heating with switch 10.

**49. B) Work lamps**

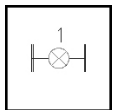
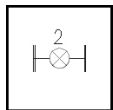
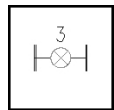
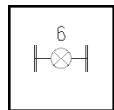
Switch on the work lamps with switch 9.

**49. C) Rotating beacon**

Switch on the rotating beacon with switch 11.

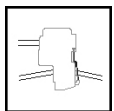
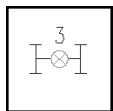
**49. D) Fog tail light**

Switch on the fog tail light with switch 12.

**50. A****50. B****50. C****50. D****50. A, B, C, D) Transversal differential lock axles 1, 2, 3 and 6**

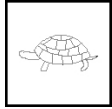
Switch on the transversal lock with switch 1.

If one of those lamps stays on while the transversal lock is switched off, the defect must be remedied immediately. Driving is impossible.

**51. A****51. B****51. A, B) Longitudinal differential lock transfer case and axle 3**

Switch on the longitudinal lock with switch 2.

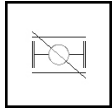
If one of those lamps stays on while the longitudinal lock is switched off, the defect must be remedied immediately. Driving is impossible.

**51. C) All-terrain gear**

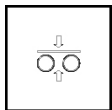
All-terrain gear in the transfer case is activated with switch 3.

**51. D) Road travel gear**

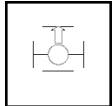
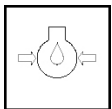
Road travel gear in the transfer case is activated with switch 3.

**52. A) Axle blocking**

Axle blocking activated with switch 18.

**52. B) Levelling**

Levelling ready. Activated with switch 17.

**52. C) Off-the-road mode suspension****52. D) Oil pressure suspension and outriggers**

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, due to the fact, that the outriggers, axles or outrigger beams are blocked while extending or retracting the cylinders.

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

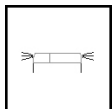
If no outrigger/suspension function is operated, the burning of the lamp indicates a malfunction.

**53. A) Outrigger control**

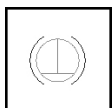
Outrigger control activated with switch 27.

**53. B) Hazard warning lights**

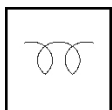
Switch on the hazard warning lights with switch 4.

**53. C) Aeronautical warning light**

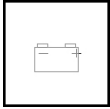
Switch on the aeronautical warning light with switch 5.

**53. D) Retarder**

The retarder is activated with lever 66.

**54. A) Pre-heating**

This lamp burns while the engine is pre-heated.

**54. B) Charging current batteries**

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

**54. C) Air cleaner**

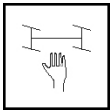
If the air cleaner passes insufficient clean air, the filter is blocked or contaminated. Remedy the problem immediately.

56. Rear axle steering

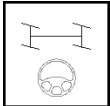
The switch for rear axle steering has three stages:

1. Switch in middle position

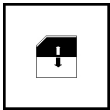
If the switch is in middle position the computer (ECU) sees to it, that the two rear axles are steered in opposite direction of the three front axles. This is the normal mode.

**2. Switch in left position**

When you want to steer the rear axles manually, e.g. to drive in crab steering mode, you can do so using steering knob 47 to steer the axles in any which way you want.

**3. Switch in right position**

The most usual position for crab steering mode is fully to the right. In this position the computer sees to it, that the rear axles are at the correct angle with every turning of the steering wheel 64.

**57. Door windows**

The door windows can be opened or closed with switches 57 and 58. On the dashboard you will also find a switch in front of the co-driver. All these switches only function with turned on ignition and closed door.

**59. Interior lighting**

The interior lighting on driver's side can be switched on/off with switch 59, on co-driver's side with switch 60.

63. Ignition

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

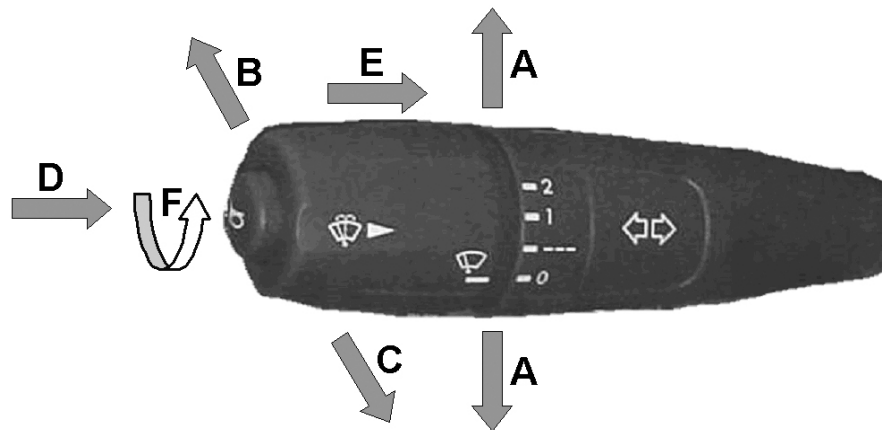
0 = off

1 = contact on

2 = pre-heat

3 = starting (also press)

65. Control lever blinker/windscreen wiper Interval



Picture 2-13

- A) With this switch the driving direction is indicated.
- 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 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.

66. Control lever retarder/cruise control/ESC

With this lever the retarder can be set in 4 different positions. Furthermore, with this lever the cruise control and ESC (Engine Speed Control = temporary increasing the rpm) can be operated.

75. 12V branch box

This is a general 12 Volt branch box meant for e.g. a handy battery charger.

77. Temperature control cab heater

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

78. Fan control

With this selector switch the heating fan can be set at 3 speeds and 0.

79. Parking brake

By pulling the lever fully backwards the parking brake is engaged. To disengage the parking brake, the lever must be pulled upwards, so it will return in forward position.



2.4. Air-conditioning operation (Option)

When chosen for this option, the air-conditioning is mounted on the ceiling of the truck cabin. (See *Picture 2-14*)



Picture 2-14

Two rotating switches are located on the interior part of the air-conditioning.

Switch B (*Picture 2-15*) is the switch for the amount of air of the interior ventilator. The air-conditioner can not be switched on when switch B is in the "0" position.

Switch A is the thermostat switch. With this switch the desired temperature can be adjusted.

Is the switch position set to the left in its lock position the air-conditioner is switched off. Turn the switch to the right to turn on the air-conditioner. The fully right position of the switch gives the coldest air flow.

When desired, the air vents on the interior part can be tilted and/or be turned to adjust the air distribution.



Picture 2-15



2.5. Driving the Spierings crane

(For all number references please refer to Picture 2-11).



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.

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 are sticking out at the front and rear;
 - the crane's height is 4 mtrs (pay attention to low passages and low branches);
- the crane's width is 3 mtrs (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.

During running in (1500 km 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.

2.5.1. Starting



CAUTION!

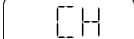
Do not run the diesel engine in closed or unventilated rooms. There is a high risk of suffocation.

Before starting the engine, the transmission must be put in neutral (N) (button 81) and the parking brake must be engaged (79).

When the crane's ignition is switched on, the following indicator lamps light up:

Lamp 33	Oil pressure
Lamp 44	Emergency steering circuit
Lamp 46	Diesel engine (on and off)
Lamp 48A	Main steering circuit
Lamp 48B	Power steering circuit
Lamp 48C	Air pressure
Lamp 48D	Parking brake
Lamp 51D	Road travel gear
Lamp 53D	Retarder (on and off)
Lamp 54A	Pre-heating (when necessary)
Lamp 54B	Charging current batteries



Display 31  The transmission carries out a self-check

Display 31  Possible when not enough air is available

When the ignition is switched on the electronic unit validates the needed pre-heating time. When pre-heating is needed lamp 54A lights up. During the pre-heating period the engine can not be started.

As soon as the engine runs only the following indicator lamps should be on:

Lamp 48C Air pressure
Lamp 48D Parking brake
Lamp 51D Transfer case on-the-road gear

Display 31  The transmission is in Neutral position.

If the engine overheats or when the engine oil pressure drops too low, a beeper will sound and the lamp oil pressure (33) will light up. If the beeper sounds continuously, the engine must be switched off immediately.

The lamp for steering circuit 2 (48A) will remain on while the vehicle stands still. It will go out the moment the vehicle starts moving.

2.5.2. Driving off

To drive off the air-pressure in the system must be 6.5 bar and the transmission should be switched from the Neutral position (N) to the Drive position (D).

On a flat road the crane accelerates fully automatically. The transmission always selects the 3rd gear to drive off.

On slopes or off-the-road the transmission must be geared down manually. To drive off proceed as follows:

- The engine is running and the parking brake is engaged (79).
- Shift the transmission in "D" (81) and, if not yet the case, to "Automatic gear shift" (80).
- Press the gas pedal and disengage the parking brake simultaneously.
- The vehicle starts to move.

At speeds between 0 and 10 km/h the hydraulic front axle drive automatically runs along. Over 10km/h the front axle drive is switched off.

2.5.3. Driving in reverse

To drive in reverse the crane must come to a full standstill.

- Press the brake pedal.
- Shift the transmission in "R" (81).

Display 31  The transmission is in reverse gear.

- Step on the gas and release the brake pedal simultaneously.
- The vehicle starts to move.

2.5.4. Stopping

The driver can slow down the vehicle to full stop in every gear. In case of a short stop, e.g. at traffic lights, you do not have to shift gears.



2.5.5. Switching off the engine

To switch off the engine the ignition key must be turned to the left.

If the engine has run for a longer period of time when fully loaded, 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.

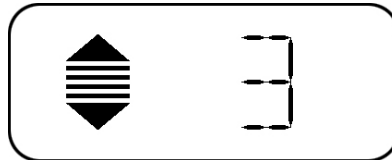
(There is a chain near the left-hand front wheel, under the deck. If the engine brake does not work, you can switch off the engine with this chain.)

2.6. Shifting gear

The AT6 is fitted with an automatic transmission, so there is no clutch pedal in the truck cab. The controls needed to drive the crane are control lever (80) and rotary switch (81) on the centre control panel and gas pedal (69). For information regarding the selected gear etc. you will find a display on the dashboard (31). The transmission has 16 forward gears and 1 reverse.

2.6.1. Automatic gear shift

To select automatic gear shift, rotary switch (81) on the middle console must be turned in pos. "D" (Drive). Then display (31) in the truck cab shows the gear number and at the left two arrows and four bars (*Picture 2-16*).

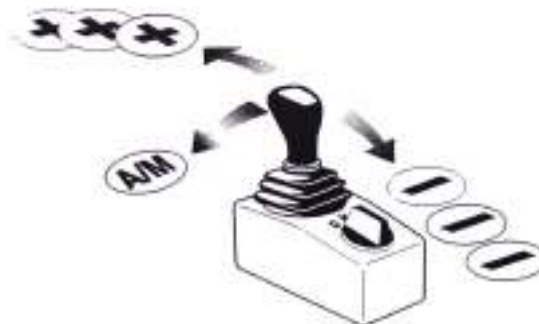


Picture 2-16

To drive off you have to step on the gas. The gas pedal must be stepped down while accelerating. The transmission shifts gears automatically. While gear shifting, the transmission electronics reduces the engine speed automatically. The electronics also operate the clutch and shift to the next gear. The display shows the gear in which the transmission is shifted. While accelerating from 0 to 85 km/h the transmission will shift gears automatically at random. If you drive at full speed the transmission will skip gears sooner. When you drive at the desired speed the gas pedal must be kept in the relevant position.

If you operate the brake and drive on at a lower speed, the transmission will select the correct gear depending on the speed, engine rpm and gas pedal position.

In the pos. "Automatic Gear Shift (A)" you can shift gears manually with the gear shift lever (*Picture 2-17*). By moving the gear shift lever forward or backward once or more times, you can select a higher or lower gear. Make sure you keep within the safe range of e.g. the engine rpm; otherwise the transmission will not carry out the command.



Picture 2-17

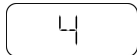


2.7. Manual gear shift

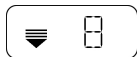
For the sake of easy operation it is best not to use the manual gear shift too often.

To shift gears manually the gear shift lever must be moved to the left. The two arrows and four bars on the display disappear. While the crane stands still the display only shows the number of the selected gear. As soon as the crane moves the display shows the ideal gear shift move by means of the arrows and bars.

Three bars and one arrow downward mean gearing down from 8th to 5th gear. To do this move the gear shift lever backwards three times (*Picture 2-17*).



Manual operation; 4th gear



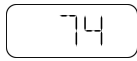
Manual operation; 8th gear with gear down alternative to 5th gear. (1 bar stands for 1 gear shift alternative).

2.7.1. Display indications

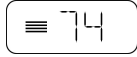
Display	Indication
	Transmission self-check
	The truck's pneumatic system does not supply enough air pressure to shift gears.
	Do not step on the gas. If the indication does not disappear you have to stop immediately. Driving on is impossible.
	Clutch overloaded. Gear down or shift to neutral to counteract the overload.
	Clutch is worn. Replace the clutch as soon as possible. .
	Automatic gear shift. (Transmission is in 8 th gear)
	Manual gear shift. (Transmission is in 4 th gear)
	Manual gear shift. (Transmission is in 8 th gear with gear down alternative to 5 th gear)
	Electronic error. Shows up when the display communication is upset by the drive electronics.
	System error. Shows up when the transmission can only operate with restrictions. Driving on is possible, however, the malfunction must be remedied as soon as possible.
	Major system error. Stop immediately and remedy the malfunction.



To view the error message in case of a system error move the gear shift lever forwards 1 time. A 2 or 3 digit number shows up in the display as follows:



2-digit number. In this case error no. 74.



3-digit number. The 4 bars stand for a hundred. In this case error no. 174.

For the meaning of the error codes please contact Spierings Cranes or ZF Friedrichshafen AG.

2.8. Brakes

The crane is equipped with four braking systems:

4. Operating Brake
5. Parking Brake (on axle 3, 4 and 5)
6. Vacuum brake
7. Retarder

2.8.1. 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 (39 and 42). If the pressure drops below 5.5 bar, indicator lamp on the dashboard (48C) lights up. The crane must not be driven.

2.8.2. 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 (79). 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.

2.8.3. Vacuum brake

The vacuum brake works by closing the fuel supply. Also the exhaust is closed by means of a valve. The vacuum brake controls are to the left of the clutch pedal on the truck cab floor (67). 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).

2.8.4. Braking with the retarder

For slowing down when driving at high speed or on long stretches down-hill, the use of the retarder is profitable. It reduces operating brake wear. The retarder is activated with the control lever at the right of the steering column. (Refer to 2.9 Retarder/ESC/CC). This lever has 4 positions to control the brake power. The indicator lamp (53D) on the control panel indicates if the retarder is activated.

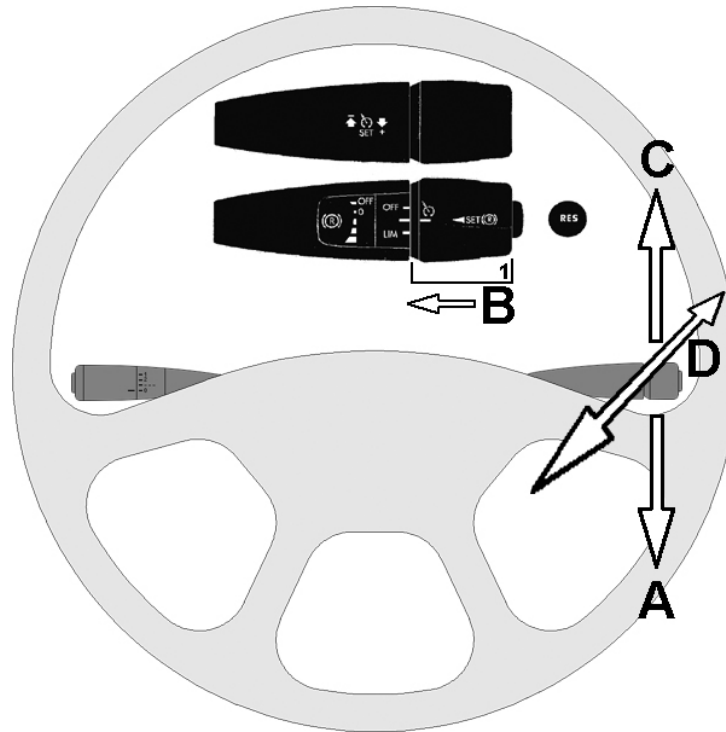
While the retarder is activated you can not step on the gas.

In case of frequent use of the retarder the transmission oil temperature can rise considerably. If so, the retarder control reduces the braking force. While using the retarder keep an eye on indicator lamp (43) and temperature gauge (41). When the lamp lights up the oil temperature in the retarder is too high. Gear down, put the retarder in a lower position or switch it off. If this is not effective to lower the oil temperature, the retarder will automatically switch off (at 145°C also a beeper sounds).

When during the drive the retarder was frequently used, the engine must only be switched off when the indicator lamp goes out.

2.9. 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 (66) (Picture 2-18).



Picture 2-18

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.

2.9.1. 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 2-18)

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

2.9.2. 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 2-18, 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 per tip.)

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

		<i>Result</i>		
		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 . (E.g. in case of a collision.)

2.9.3. 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.

By turning the tip of the lever (1, *Picture 2-18*) 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.

2.9.4. 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. 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 2-18*)

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.

2.10. Driving off the road



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

2.10.1. All-terrain mode transfer case

When you have to drive off the road or at low speed (e.g. driving with erected tower) you can put the gear shift high/low in low speed (3).



Only shift the transfer case from high to low or the other way round when the vehicle has come to a full stop and the transmission is shifted in neutral!

The mode of the transfer case is shown by the indicator lamps on the control panel (turtle (51C) or hare (51D)).

2.10.2. Longitudinal differential lock

When there is insufficient traction while driving off the road, the longitudinal differentials can be locked with button "longitudinal differential lock" (1).



When the longitudinal lock is switched on, it is shown by indicator lamps (51A and 51B) on the dashboard.

**CAUTION!**

The longitudinal differential lock may only be engaged or 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, make slight steering movements when driving off. Now the lamps should go out (make sure they do!).

2.10.3. 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.

Operate the button " transverse lock" (2). 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. The locking of the axles is shown by indicator lamps (50A, 50B, 50C and 50D) on the dashboard.

Before driving on a paved road, it is required to release the transverse differential lock.

**CAUTION!**

The transverse lock must only be switched on when the vehicle has come to a full stop and the longitudinal lock has already been switched on.

Driving with engaged transverse differential lock is only allowed when the vehicle moves in a straight line on loose ground!



After releasing the transverse differential lock make sure the indicator lamps are out! If this is not the case, make slight steering movements when driving off; this should make the lamps go out (make sure of this).

2.10.4. Hydraulically driven front axle

The truck front axle (axle 1) is not driven through the transfer case but by a separate hydraulic drive. This hydraulic drive is only available at low speeds (under 10 km/h), so it is especially meant for driving off the road.

The higher the oil pressure, the more power is supplied by the drive. The pressure is shown by the oil pressure gauge (40) in the dashboard.

By driving at a higher rpm, the pressure can be increased, as the hydraulic pump is connected to the engine. Do this by stepping on the gas.

2.11. Parking

Put the transmission in neutral and engage the parking brake. Fully lower the vehicle. (2.12 Axle height adjustment) Switch off the engine and subsequently the battery switch.

When you park the (rigged down) crane temporarily in wintertime, 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:

6. Extend the front axles until the front axle suspension cylinders are fully extended.
7. Subsequently retract the rear axles until the rear axle suspension cylinders are fully retracted.
8. Make sure the truck is still standing on all its wheels! (all tyres are still bulging)



2.12. Axle height adjustment

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

The axle height adjustment can be controlled from the truck cab. First engage the axle height adjustment by operating switch 18. (Picture 2-12) Next, adjust the axle height to your liking by means of the switches 13, 14, 15 and 16.

Switch 17 is for levelling the truck. Use levelling during driving off the road or during supporting the crane on outriggers. Furthermore, the crane may be kept in level position on slight slopes.

As soon as the end position is reached, a buzzer will sound and indicator lamp (52C) on the dashboard will go on.

2.12.1. Suspension blocking

By e.g. driving with an erected tower, a stable travel is needed. This can be achieved by blocking the suspension.

Operate switch 27 (Picture 2-12) for engaging the outrigger control. As soon as both indicator lamps 52A and 53A on the dashboard are on, the accumulators are disengaged and the suspension is blocked. (The outrigger control is engaged.)

The axle height adjustment is independently from the suspension blocking still adjustable.

2.12.2. All-terrain mode

To get maximum ground clearance the crane can be put in all-terrain mode.

Proceed as follows:

- Engage the axle height adjustment (18).
- Extend all axle cylinders (13) (they will not extend fully, so some play remains).

2.12.3. Levelling

During levelling the axle suspension is automatically adjusted in transport mode. This is useful when the axle height had become unsettled due to e.g. outrigger operation, all-terrain mode or standstill for a long period of time.



Always level the crane before transport. This because of the crane's 4 meter transport height!

The outrigger control must be disengaged before levelling the crane (27). No indicator lamps concerning axle height adjustment or outrigger control are seen on the dashboard.

The truck 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 on the dashboard is on (52B). Now reset the switch.



You can only level the crane in transport mode.



Switch levelling (17) must be off before driving off. No indicator lamp is on.



You can not level the crane when the brake pedal is operated.

2.13. Independent rear axle steering

In the independent rear axle steering mode the rear wheels steer in the same direction as the front wheels. The truck can travel diagonally forward or in reverse. This could be desirable at some sites to get e.g. a favourable set up position.

2.13.1. Switching on the independent rear axle steering

**CAUTION!**

The crane must be in transport mode.

To switch on the independent rear axle steering proceed as follows:

- Block the suspension (18);
- Fully press out all axles (13);
- Switch on the independent rear axle steering. You can choose between synchronized (56C) and manual (56B) steering. The selected mode is shown by indicator lamp (56D or 56A).
- When the independent rear axle steering is activated, axle 3 and 4 will be automatically retracted. Axle 3 and 4 are now free from the ground.



Check the axle height of axle 3 and 4. They should be at least 10 cm free from the ground.

2.13.2. Manual steering

If you select manual steering, the wheels of axle 5 and 6 can be steered with steering knob (47) on the dashboard independent of the wheels of axle 1 and 2. The wheels of axle 1 and 2 are steered with the steering wheel.

2.13.3. Synchronized steering

In synchronized steering mode the electronics on the separate rear axle steering will steer the wheels of axles 5 and 6 automatically in the same direction as the wheels of axles 1 and 2.

The wheels of axles 1, 2, 5 and 6 are steered synchronously with the steering wheel in the truck cab.

2.13.4. Driving in crab steering mode

**CAUTION!**

Driving with a rigged up crane in crab steering mode is forbidden!

Driving in crab steering mode with engaged transverse lock is forbidden!

While driving in crab steering mode the maximum speed is electronically limited to 10 km/h.

2.13.5. Switching off the separate rear axle steering

The procedure for switching off the separate rear axle steering is the same for manual as well as synchronized steering.

- Retract axles 1, 2, 5 and 6 (13), so all wheels rest on the ground.
- Switch off the separate rear axle steering with button (56 centre pos.) on the dashboard;

The rear axle steering electronics will put the wheels of axles 5 and 6 in the correct direction. The wheels of axles 1, 2 and 3 do not have to be in a certain position.



Make sure the rear axle steering electronics have put the wheels of axles 5 and 6 in the correct direction. (All wheels in straight position and in alignment).

- The engaged longitudinal lock is automatically released.



Make sure the longitudinal lock indicator lamps on the dashboard are out!

- Level the crane (17);

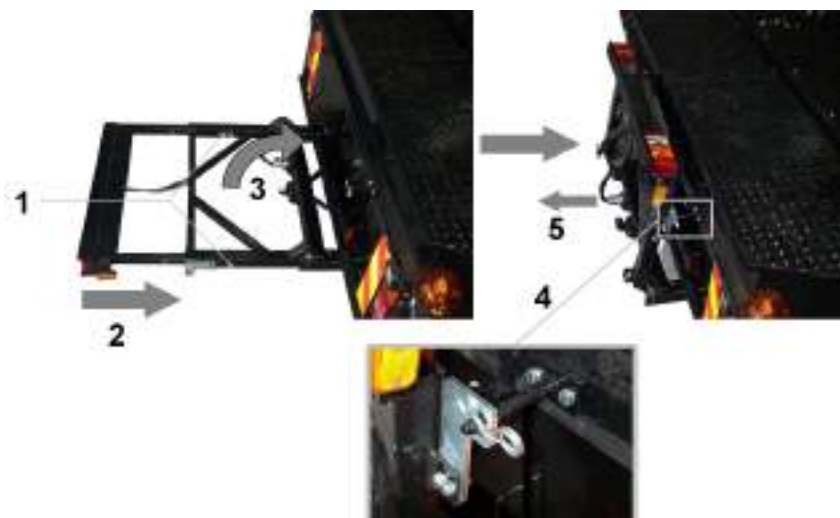
2.14. Driving with erected crane

Please refer to the SK1265 manual.

2.15. Driving with trailer

To tow a trailer the crane is fitted with a towing hook with a 7-pins socket for lighting. To link up the trailer, first the bumper, if mounted, must be folded up.

1. Remove the safety clips from the 2 pins in the case and pull out the 2 pins (*Picture 2-19*).
2. Slide the rear part to the front until the pins can be inserted in the next hole. Then lock them with the safety clips.
3. Remove the safety clip from the pin in the frame and fold up the complete bumper against the vehicle frame.
4. Now lock the bumper with the safety clip.
5. Then pull out the plug from the socket.
6. Link up the trailer and plug the trailer plug in the socket.
7. Check if the lighting works properly.



Picture 2-19

2.16. Towing the crane



Please always consult Spierings Kranen before towing the crane.

2.16.1. 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 some switches on 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.
- Link the towing vehicle with a tow bar to the crane shunt coupling. Now the crane may be towed.

2.16.2. Towing when the diesel engine is out of order

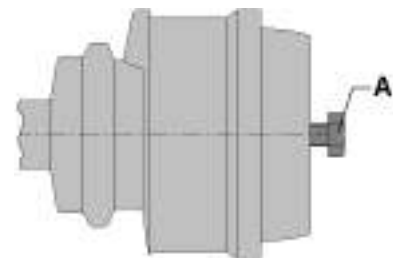
If the diesel engine is out of order you may proceed in the same way as with a running diesel engine. However, there are a number of additional problems:

- 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 the crane must be moved for a (very) short distance and 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 3, 4 and 5 (*Picture 2-20*). The spring tension is removed from the brake, so it is released.



Picture 2-20

When the crane must be moved for a long distance, external air pressure is required.

Using the external filling nipple above the front right outrigger beam the air pressure can be restored. (*Picture 2-21*)



Picture 2-21

***Transfer case in neutral***

The transfer case can also be shifted into neutral using the external filler nipple. (*Picture 2-21*)

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. The steering of the wheels of axle 5 and 6 is fully out of order. The emergency system has put the wheels of axle 5 and 6 in straight on position automatically. Only axles 1, 2 and 3 are still steerable. The crane's turning circle will increase considerably.



3. Maintenance



"Under normal operating conditions" means:

- forty-hour week of 5 days
- 15,000 – 20,000 km/year
- Ambient temperature: -15 to 40°C



All oil- and filter specifications are found in Chapter 11, *Technical Data*.

3.1. Safety



Observe all warning and safety rules stated in this document. The safety must be observed at all times.



Never carry out repairs to the truck nor change the settings without explicit approval and necessary education. Bad repair work or wrong settings may cause dangerous situations.

3.1.1. Clothing



Make sure to wear the correct clothing while carrying out maintenance on the truck. . E.g. do not wear loose clothing, loose hanging hair and / or jewellery, which could get caught between moving parts.

3.1.2. Surroundings



The surroundings of the crane to be serviced, must be free from oil or other liquids, to prevent hazardous situations.

3.1.3. Diesel engine



Do not run the diesel engine in a closed or non-ventilated room. There is a high risk of suffocation.

3.1.4. Moving parts



Stay at a safe distance from rotating and/or moving parts.



3.1.5. Oils and coolant



Different kinds of oil and lubrication, coolant, windscreen washer fluid, battery acid and diesel oil can present a health hazard when touched. Avoid any physical contact with these substances!

3.1.6. Environment



In order to be able to meet the present environmental requirements, you are advised to observe the following rules:

- Never pour used engine oil, hydraulic oils, greases and coolant in drains, sewers or on the ground.
- Make sure all used fluids, old batteries, oil filters and other chemical waste, are handed in separately to the proper authorities for recycling or destruction.
- See to proper and regular truck maintenance. A well maintained engine contributes to saving fuel and reduces polluting exhaust fumes.

3.1.7. Change oil cooling system



Be careful when changing the oil. Hot oil can cause severe bodily harm.

Never remove the filler cap from the cooling system while the engine is at operating temperature.

3.1.8. Fire hazard



To prevent fire hazard the engine and its surroundings must be free from highly inflammable substances.

3.1.9. Cleaning components



While cleaning with high-pressure cleaner the following must be observed:

- While cleaning the radiator/intercooler make sure the cooling fins do not get damaged.
- While cleaning the engine compartment do not aim directly at electrical components such as starter motor, generator, sockets etc.
- Make sure no water penetrates through the breathers on the transmission, transfer case and differentials.



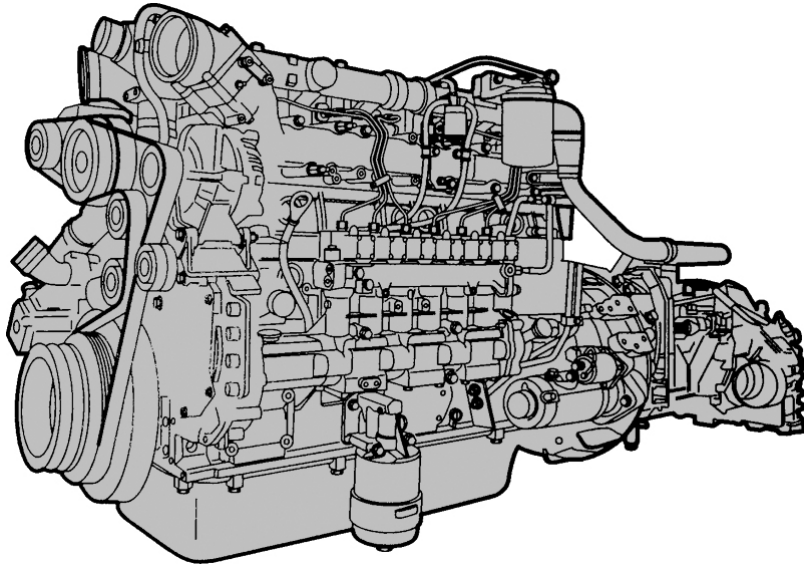
3.2. Maintenance plan for the AT6 truck

Component/ System	Maintenance	Daily Maintenance	Weekly Maintenance	Bi-monthly Maintenance	Annual Maintenance (15,000km)	Bi-annual Maintenance	5-yearly Maintenance
Diesel engine	Engine oil				Change		
	Oil filter	Check			Replace		
	Cooling system			Check			
	Coolant		Check			Change	
	Antifreeze				Check		
	Radiator/intercooler/oil cooler				Check		
	Pneumatic system			Check			
	Air cleaner		Clean		Replace		
	Fuel system			Check	Replace		
	Fuel filter				Replace		
	Water separator			Drain	Replace		
	Filter water separator				Check		
	V-belts				Check		
	Exhaust system				Check		
	Valve clearance				Check		
Drive System	Transmission			Check			
	Oil transmission			Check		Change	
	Oil filter retarder				Replace		
	Transfer case			Check			
	Oil transfer case			Check	Change		
	Axles			Check			
	Oil differentials			Check	Change		
	Oil axle hubs			Check	Change		
	Tyres			Check			
	Tyre pressure		Check				
Steering system	Brake linings			Check	Check		
	System			Check	Align		
	Lighting	Check			Check		
Electrical System	Control panel lighting	Check			Check		
	Batteries			Check			
Hydraulic System	Hydraulic oil			Check			Analyse
	Return oil filters				Replace		
	Fine filter				Replace		
	Accumulators				Check		
	Hoses and couplings			Check			



Component/System	Maintenance	Daily Maintenance	Weekly Maintenance	Bi-monthly Maintenance	Annual Maintenance (15,000km)	Bi-annual Maintenance	5-yearly Maintenance
Pneumatic System	Air dryer filter					Replace	
	Air vessel		Drain				
	Oil atomizer			Check			
	Water separator			Drain			
	Brake pressure				Check		
	Hoses and couplings				Check		
Lubrication	Central lubrication		Clean	Check			
	Manual lubrication			Lubricate			
Miscellaneous	Windscreen washer fluid						
	Fire extinguisher		Check		Check		

4. Diesel engine



Picture 4-1

As drive source the Spierings AT5 is fitted with a DAF-turbo diesel engine with intercooler.

Technical data

Brand/type:	DAF XE-390C1
Fuel System	Water cooled 6 cylinder 4-stroke diesel engine with direct injection
Inlet system	Turbocharger intercooling
Motor capacity	12.58 ltrs
Maximum performance	390 kW at 1900 rpm
Maximum torque	2350 Nm at 1100 -1500 rpm
Compression ratio	16.0:1
Bore x stroke	130mm x 158mm
Emission level	Euro 3
Weight	1080 kg



Warning!

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

4.1. Maintenances at commencement of operations

Not later than 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.

Not later than 4-5 months after delivery

Spierings 4 monthly inspection (conform superstructure).



This inspection should preferably be carried out by service staff of Spierings Kranen. 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

In order to gain access to the diesel engine, various engine cowling plates can be removed. The left and right cover plates can always be removed without problem; however their removal barely gives access to the engine.

The three upper cowling plates must also be removed when the tower is in upright position. The central plate gives direct access to the engine. You can also reach the engine through the bottom of the truck, where there are no cover plates.



Picture 4-2



4.3. Engine oil

4.3.1. Check the engine oil level



Check the engine oil level daily.

1. Make sure the truck stands on level ground.
2. Leave the engine to stand still for at least 5 minutes, so that the oil can settle in the sump.
3. Pull the dipstick (A) from the holder next to the electrical cabinet and clean with a non-fluffy, clean rag (*Picture 4-3*).



Picture 4-3

4. Reinsert the dipstick in the holder and take it out again.
5. Check if the oil level is between the "min" and "max" marking.
6. Reinsert the dipstick in the holder.
7. If necessary top up engine oil. (*4.3.2 Top up engine oil*)

4.3.2. Top up engine oil

1. Make sure the truck stands on level ground.
2. Turn the filler pipe outside as indicated in *Picture 4-4*.
3. Unscrew the red cap on the filling pipe (1).
4. Always top up engine oil of the same brand and type. (In doubt please always consult Spierings Cranes.)
5. Check the oil level with the dipstick. (*4.3.1 Check the engine oil level*)



Picture 4-4



4.3.3. Change engine oil



Change engine oil after every 15,000km or at least once a year and during the annual maintenance.

1. Make sure the truck stands on level ground.
2. Preferably run the engine till it is at operating temperature and then switch it off.
3. Remove the sound absorption plate under the engine.
4. Place a sufficiently big trough under the drain plug (quick drain) (*Picture 4-5, 2*).
5. Remove the cap from the quick drain (2) at the bottom of sump (1) and connect the supplied drain hose. It will open the plug so the oil can run off.



Picture 4-5

6. Remove the drain hose and replace the cap.
7. Fill the engine with approx. 39 ltrs of engine oil. (*4.3.2 Top up engine oil*)



4.4. Oil filter engine

4.4.1. Oil filter replacement



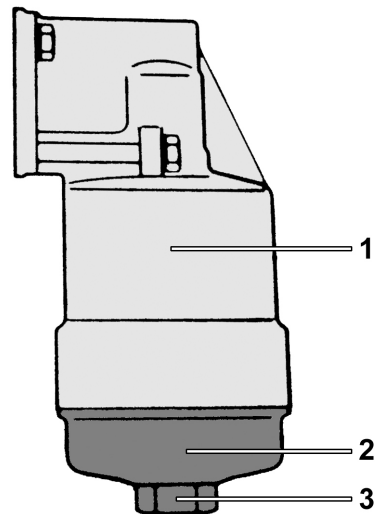
Replace the oil filter during the annual maintenance or every 15.000 operating hours under normal operating conditions.

1. Place a sufficiently big trough under the oil filter (1) at the left next to the sump (2). (Picture 4-6)



Picture 4-6

2. Unscrew cap (2) several turns until the oil runs off filter housing (1) through outlet hole (3) (Picture 4-7).
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 the engine oil level)
10. Check for leaks.



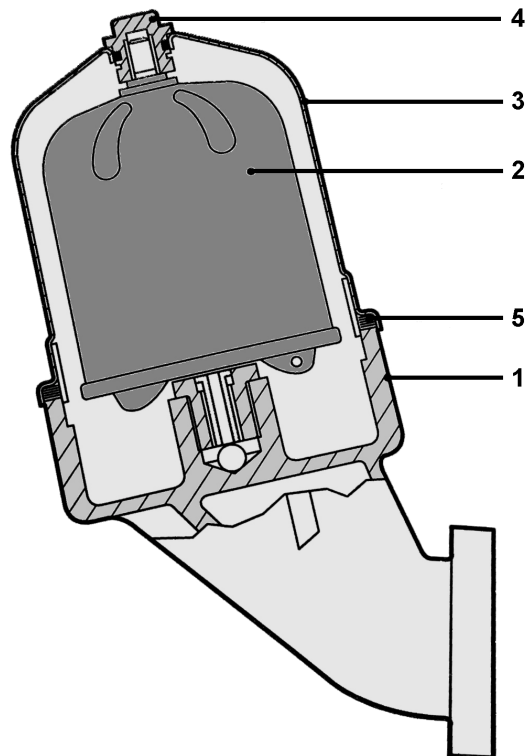
Picture 4-7

4.4.2. Centrifugal filter replacement



Replace the centrifugal filter during the annual maintenance or every 15.000 operating hours under normal operating conditions

1. Clean de cap (3) and its surroundings. (*Picture 4-8*)
2. Remove the central bolt (4) and remove the cap.
3. Remove the rotor/filter element (2) from the cap.
4. Clean the insides of the cap.
5. Check the central bolt (4) for damages and replace when necessary.
6. Replace the seal-ring (5).
7. Install the new rotor/filter element in the cap.
8. Sparingly coat the seal-ring with engine oil and replace the cap.
9. Tighten the central bolt with a torque of 20Nm.
10. Start the engine and check for leakages.
11. Check the engine oil level and refill when necessary.



Picture 4-8

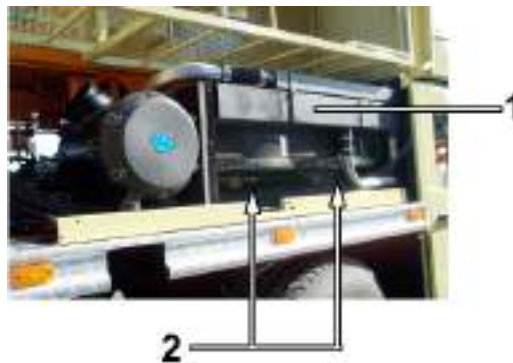
4.5. Cooling



Check hoses, lines and couplings every two months for leaks and check radiator, intercooler and fan for damage.

The DAF diesel engine is water-cooled. The radiator together with the intercooler and oil cooler are situated at the right-hand side under the engine cowling in horizontal position (see *Picture 4-9*).

1. Combined radiator, intercooler and oil cooler.
2. Double hydraulically driven fans.



Picture 4-9

4.5.1. Check the coolant level



Under normal operating conditions check the coolant level every week.



NEVER remove the cap from the little expansion tank while the engine is at operating temperature.

1. If it is hot, leave the engine to cool down properly.
2. Remove the left cover plate on top of the engine cowling.
3. Carefully open filler cap (2) from the little expansion tank (1).
4. Look into the opening to check if you can see the coolant level.
5. If necessary top up coolant. (*4.5.2 Top up Coolant*)
6. Close the filling opening with the cap.
7. Reinstall the cover plate.



Picture 4-10

4.5.2. Top up Coolant



Prevent pouring cold coolant in a warm engine. If it is inevitable under special circumstances, it should be done very slowly while the engine is running.



Coolant is a harmful substance. Protect the eyes and skin when you are handling it.

1. Set the truck cab heater to max. "warm", so the heater cock is fully opened.
2. Remove the left cover plate on top of the engine cowling.
3. Carefully open filler cap (2) from the little expansion tank (1). (Picture 4-10)
4. Top up until the level reaches the filling opening of the little expansion tank.
5. Start the engine and slowly fill the cooling system.
6. Warm up the engine so the thermostat is opened.
7. Stop the engine and check the fluid level. (4.5.1 Check the coolant level)

4.5.3. Changing coolant



Change the coolant every two years under normal operating condition.

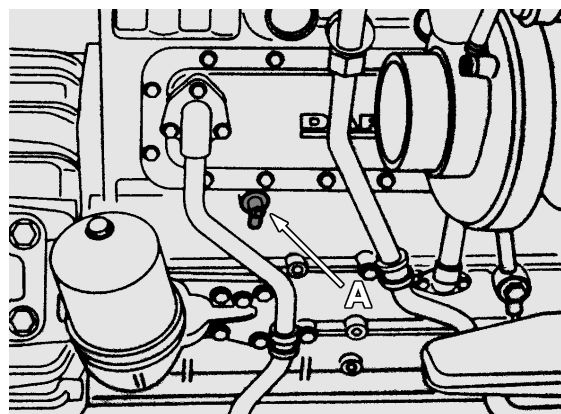


Prevent pouring cold coolant in a warm engine. If it is inevitable under special circumstances, it should be done very slowly while the engine is running.



Coolant is a harmful substance. Protect the eyes and skin when you are handling it.

1. If it is hot, leave the engine to cool down properly.
2. Set the truck cab heater to max. "warm", so the heater cock is fully opened.
3. Remove the cooling system filler cap.
4. Put a trough under the drain plugs.
5. Drain the coolant at the engine block through drain cock (A). (Picture 4-11)
6. Drain the coolant at the radiator at position (B)
7. Close the drain plug.
8. Fill the system with the prescribed coolant (4.5.2 Top up Coolant).



Picture 4-11



4.5.4. Antifreeze



Check the antifreeze concentration every year, before commencement of the winter season.

We recommend that you check the coolant for the antifreeze concentration every time before the winter season starts.

Apply preferably 40% antifreeze on ethylene glycol basis.

4.5.5. Radiator/intercooler/oil cooler



Check the radiator, intercooler and oil cooler for contamination and deposits every year.



If the radiator is cleaned with water, special care should be taken of the electrical system. Avoid sensitive parts such as wiring and electronic components. Never clean the radiator with a high pressure cleaner!



While cleaning the radiator we advise you to wear safety goggles.

If it is necessary to clean the radiator, the right upper cover plate of the engine cowling must be removed.

- Cleaning with compressed air

The easiest way to clean the radiator is by means of compressed air. Always blow clean the fins in longitudinal direction to prevent damage.

- With cold or hot water

Preferably use a cold cleaning agent. Leave it to soak about 10 minutes and rinse it with a bound jet stream of water in longitudinal direction of the fins, in order to prevent damage.

4.6. Air inlet system

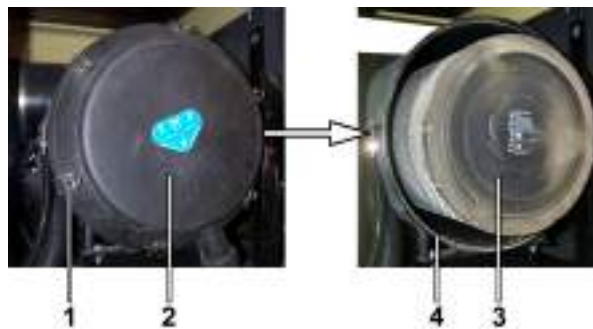


Check hoses, pipes and couplings for leaks every two months.

4.6.1. Clean air cleaner



Clean the air cleaner every week under normal operating conditions. In case of damage to the air cleaner cartridge and seal ring, the cartridge must be replaced.



Picture 4-12

1. Make sure the engine is not running.
2. Open the right side plate of the engine cowling.
3. Release the clips (1) at the side of the air cleaner lid (2) and remove the lid (Picture 4-12).
4. Remove the air cleaner cartridge (3) from the air cleaner housing (4).
5. Check for filthiness inside the air cleaner housing and lid and clean if necessary.
6. You could clean the air cleaner from inside out with compressed air (max. 5 bar).



Picture 4-13

7. Reinstall the filter cartridge in the housing after having slightly oiled the seal ring with a non-aggressive oil or grease, which will not harm the rubber. (Vaseline).
8. Fasten the air cleaner lid with the clips.
9. Close the side cover.



4.6.2. Air cleaner cartridge replacement



Replace the air cleaner cartridge every year under normal operating conditions.

1. Make sure the engine is not running.
2. Open the right side plate of the engine cowling.
3. Release the clips (1) at the side of the air cleaner lid (2) and remove the lid (*Picture 4-12*).
4. Remove the filter cartridge (3) from the housing (4).
5. Check for filthiness inside the housing and clean if necessary.
6. Fit a new filter cartridge in the housing after having slightly oiled the seal ring with a non-aggressive oil or grease which will not harm the rubber (Vaseline).
7. Fasten the air cleaner lid with the clips.

4.7. Fuel system



Check hoses, pipes and couplings for leaks every two months.



Prevent open fire while working on the fuel system at all times. Smoking is strictly forbidden!

4.7.1. Replace fuel filter



Replace the fuel filter during the annual maintenance or every 15.000 operating hours under normal operating conditions.

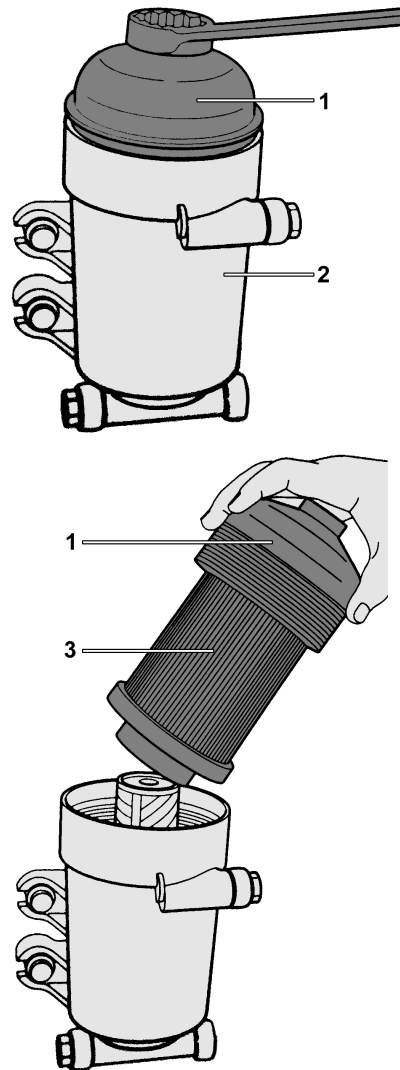
The fuel filter (A) is situated at the left of the diesel engine (*see Picture 4-14*).

To get access to the filter the tower has to be in upright position. Subsequently the centre plate on the engine cowling must be removed.



Picture 4-14

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 4-15*).
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 cowling.



Picture 4-15

4.8. Fuel filter/water separator

The fuel filter/water separator (1) can be found in the middle of slewing ring (2) (see *Picture 4-16*). This filter is the fuel system pre-filter.



Picture 4-16

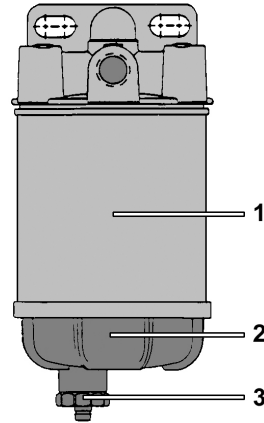


4.8.1. Drain the water separator



Drain the water separator every week.

1. Put the tower in upright position.
2. Loosen the drain plug (3) at the bottom of the water separator some turns and let the water run off (*Picture 4-17*).
3. Close the drain plug as soon as diesel fuel comes out.



Picture 4-17

4.8.2. Fuel filter/water separator replacement



Replace the filter in the water separator during the annual maintenance under normal operating conditions.

1. Put the tower in vertical position and switch off the engine.
2. Place a trough under the filter.
3. Loosen the drain plug (3) at the bottom of the water separator some turns and drain all the fuel from the filter (*see Picture 4-17*).
4. Loosen the filter element (1) together with bottom (2) by turning it to the left.
5. Remove the bottom from the old filter and clean the O-ring with a clean, non-fluffy cloth.
6. Grease the bottom sealing rubber and the new filter element with engine oil.
7. Screw the bottom on the new filter element and fill it with clean diesel oil.
8. Reinstall the element manually.
9. De-aerate the fuel system.

4.9. V-belts

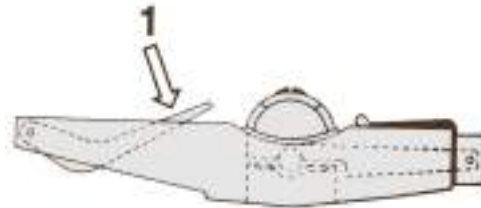
4.9.1. V-belts inspection



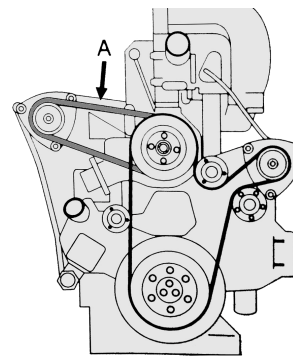
Check the V-belts during the annual maintenance or every 15.000 operating hours under normal operating conditions.

Check the V-belt tension with special tools (DAF No. 1240443).

1. Set the gauge on zero by pressing the gauge arm (1). (Picture 4-18)
2. Place the V-belt extensometer in the centre of the V-belt (A) between the pulleys (Picture 4-19).
3. Slowly press the V-belt with the extensometer until the extensometer produces a click-sound.
4. Carefully remove the extensometer. Make sure the gauge arm does not move.
5. Read the value indicated by the gauge arm position compared to the scale. Compare this value with the recommended pre-load (see Table 4-1).



Picture 4-18



Picture 4-19

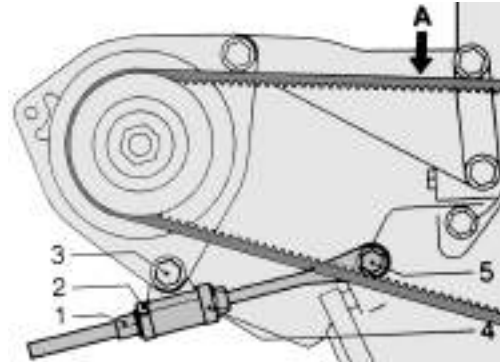
Table 4-1

V-belt tension "AVX" open flank ¹ V-belts Newton (N)	
New V-belt²	
Adjustment tension	1200
Check tension	>800
Run-in V-belt³	
Lowest tension	500
Adjustment tension	700

- 1) V-belts with open flank can be recognized by the flanks and inside, at which, except the belt's top side, there is no textile fabric in the rubber.
- 2) After installing the new V-belt the pre-load must be set to "adjustment tension" and after the test drive the pre-load must be tested for "check tension". If the gauged check tension is less than the value in Table 4-1, the V-belt must be set to minimum "check tension".
- 3) If the V-belt tension is less than "lowest tension" it must be set to adjustment tension.

4.9.2. V-belt adjustment

1. Loosen the lock nut (4) on the spindle (see Picture 4-20).
2. Loosen fixing bolt (5) on the spindle mounted on the water pump.
3. Loosen the lower fixing bolt (3) from the generator.
4. Loosen the lock nut (2) on the threaded bush (1).
5. Move the generator by means of the threaded bush until the correct V-belt tension is reached (see Table 4-1).
6. Tighten the lower fixing bolt on the generator.
7. Tighten the lock nuts on the spindle.
8. Tighten the fixing bolt on the spindle mounted on the water pump.



Picture 4-20

4.10. Exhaust system



Check the muffler, exhaust pipe and flange couplings for leaks every two months. Check also for dirt piling up near the exhaust system due to fire-risk.



Caution!

The exhaust system is hot when the engine has been running for some time.

4.11. Valve clearance check and adjustment

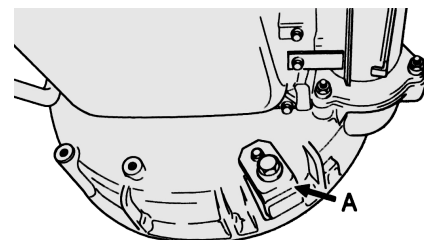


Check the valve clearance and adjust if necessary during the annual maintenance.



When opening the engine or parts of the engine dirt can enter the system, which could cause serious damage to the engine. Clean the engine before opening it.

1. Clean the valve housing cover surroundings.
2. Remove the fixing bolts on the differential.
3. Remove the valve housing cover with gasket.
4. Remove the cover plate from the flywheel housing and put the special tool (DAF No. 1310477) on the flywheel recess.
5. Using special tool (A) turn the crank shaft to the right (seen from the distributor side) until the valve of cylinder 1 start to tumble. The pistons of cylinder 1 and 6 are now in the upper dead centre (see Picture 4-21).
Tumble: the moment at which the inlet valve starts to open and the outlet valve finishes closing.



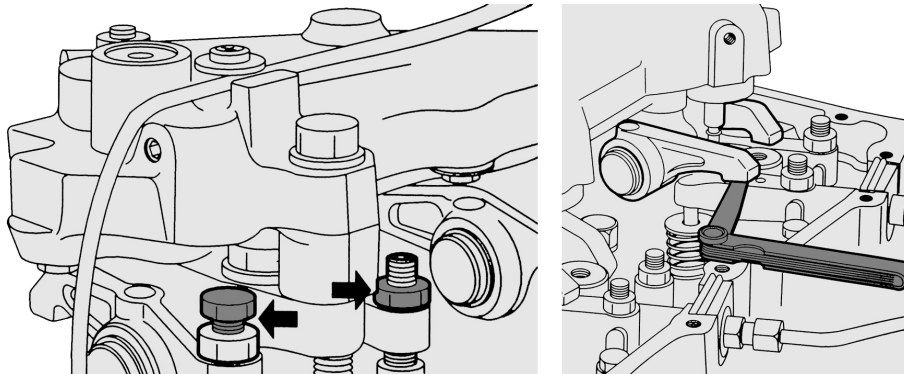
Picture 4-21

6. Check and adjust the valve clearance of the 6th cylinder. Adjust the correct valve clearance by unscrewing the locknut and turn the adjustment bolt in the correct direction. (Picture 4-22)

Valve Clearance

Inlet	0.45 mm
Outlet	0.45 mm

7. By repeatedly turning the crank shaft $\frac{1}{3}$ -turn with the special tool, the valves can be adjusted in injection order 1-5-3-6-2-4.

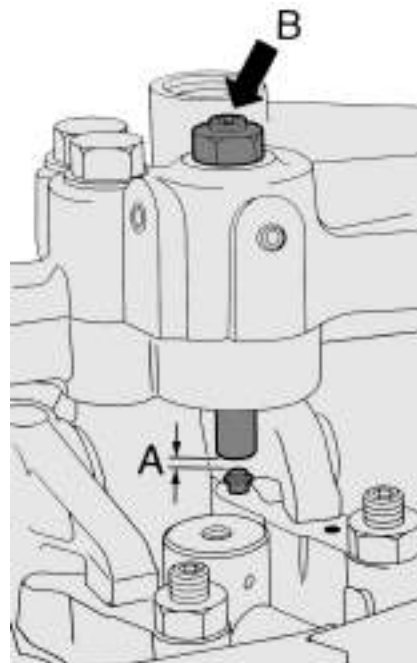


Picture 4-22

8. Clean the sealing surface of the valve housing and valve cover.
9. Install the valve housing with a new gasket.
10. Tighten the valve cover fixing bolts with a torque of 25Nm.

4.12. DEB-clearance check and adjustment

1. Clean the valve housing cover surroundings.
2. Remove the fixing bolts on the differential.
3. Remove the valve housing cover with gasket.
4. Tighten the DEB fixing bolts with a torque of 110Nm.
5. Use special tool (DAF 1310477) to get cylinder 1 in the upper dead centre. (See 4.11 Valve clearance check and adjustment)
6. Adjust the DEB-clearance (A) of cylinder 1, 3 and 5 at 1.40mm with set screw (B). (see Picture 4-23).
7. Tighten the set screw (B) with a tightening torque of 25 Nm.
8. Use special tools to get cylinder 6 in the upper dead centre.
9. Adjust the DEB-clearance (A) of cylinder 2, 4 and 6 at 1.40mm by means of set screw (B) and tighten the set screw with 25Nm.
10. Clean the sealing surface of the valve housing and valve cover.
11. Install the valve housing with a new gasket.
12. Tighten the valve cover fixing bolts with a torque of 25Nm.

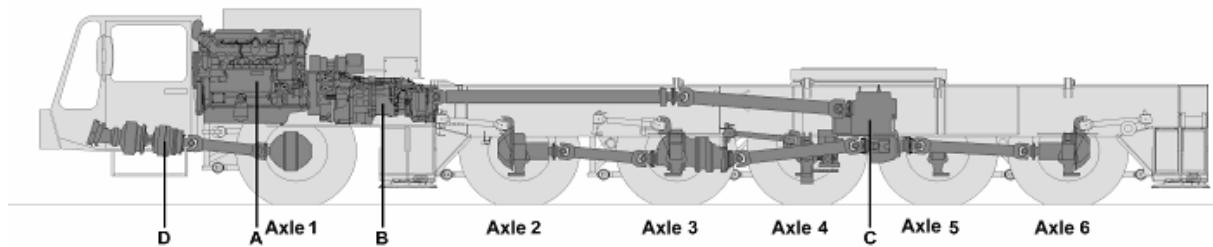


Picture 4-23



5. Drive system

Picture 5-1 shows how the AT6 drive system is constructed.

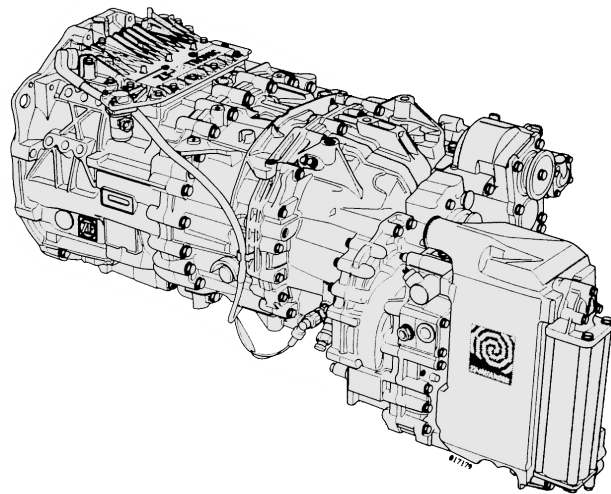


Picture 5-1

- A. Diesel engine
- B. Automatic transmission with built-in retarder
- C. Transfer case
- D. Hydraulic front axle drive

5.1. Transmission

The ZF 16 AS 2601 is a fully automatic transmission with built-in retarder. This transmission has 16 speeds with electro-pneumatic gear shift, enabling a dry clutch and making a torque converter superfluous.



Picture 5-2

5.1.1. General transmission maintenance



Check the transmission every two months for external leaks and make sure the breather is free from dirt, so that the function is guaranteed.



While cleaning with high-pressure cleaner make sure no water can enter through the breather. Water could cause serious damage to the transmission.

5.1.2. Check the oil level in the transmission

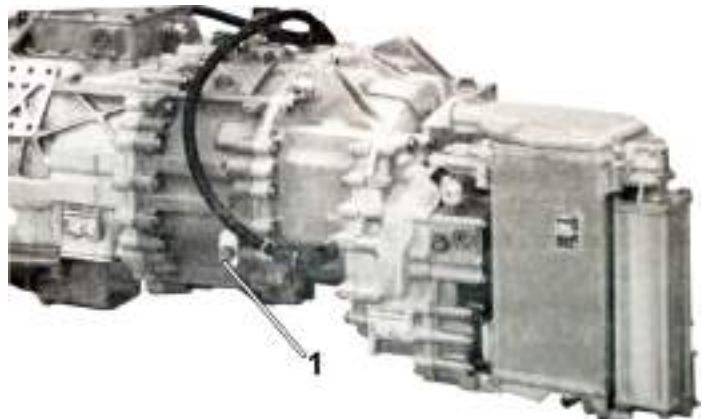


Under normal operating conditions check the oil level in the transmission every two months.



To prevent gauge errors the oil level must not be checked immediately after operation. The oil temperature must be below 40°C.

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



Picture 5-3

5.1.3. Changing oil in the transmission

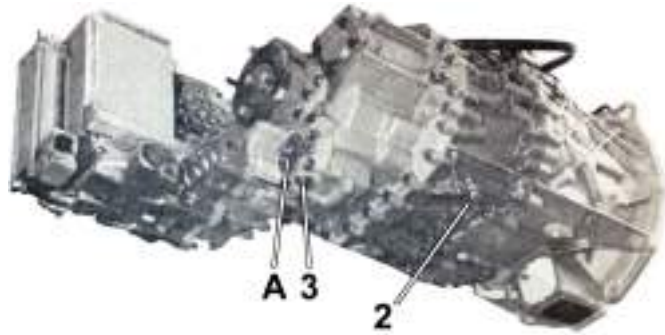


Under normal operating conditions change the oil every two years during the annual maintenance.



Caution!
The transmission and oil are hot after a long drive.

1. Make sure the truck stands on level ground.
2. Put a trough under the drain plugs.
3. Unscrew the magnet drain plugs (2 and 3) (Picture 5-4).
4. Clean the magnet plugs and renew the seal rings.
5. Remount the plugs.
6. Fill fresh oil (approx. 13 ltrs) through filling hole (1) to the filling hole edge (Picture 5-3).



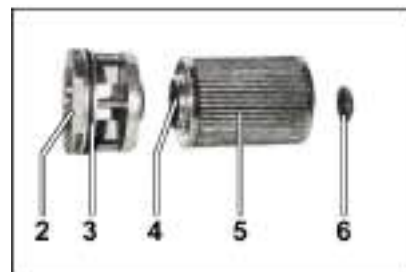
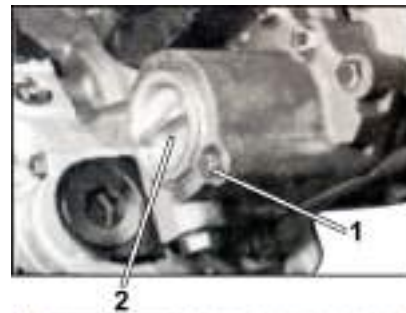
Picture 5-4

5.1.4. Renew oil filter retarder



Under normal operating conditions renew the oil filter every year during the annual maintenance, immediately after changing the oil.

1. Unscrew bolt (1).
2. Pull out the lid (2) including the filter element (5) from the filter body.
3. Remove the magnet (6) at the rear side of the filter element and clean it.
4. Remove the old filter element from the lid.
5. Check the lid and O-ring (3) for damage and replace if necessary.
6. Grease the O-ring on the lid and the new filter element (3 and 4).
7. Mount the new filter element in the lid.
8. Mount the magnet at the rear side of the new filter element.
9. Reinstall the complete unit in the filter body.
10. Tighten the lid with the bolt.



Picture 5-5



5.2. Transfer case

The transfer case is a STEYR type VG2001/396. This transfer case distributes the torque at inlet shaft (1) over 2 outgoing shafts (Picture 5-6).

Outgoing shaft (2) is for driving driven axle 2 and driven axle 3.

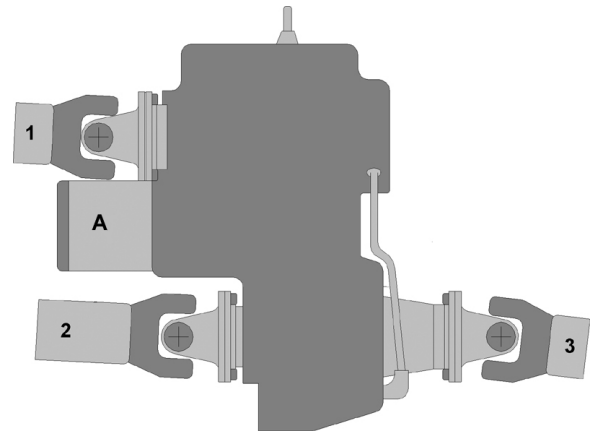
Outgoing shaft (3) is for driving driven axle 6 (see Picture 5-1).

The transfer case has two transfer ratios:

High: 1:0.89 (Road)

Low: 1:1.536 (Terrain)

Through shaft (A) a hydraulic pump is driven. This is the emergency steering pump, which is used in case the engine stalls. It only functions while the vehicle is moving.



Picture 5-6

5.2.1. General maintenance transfer case



Check the transfer case every two months for external leaks and make sure the breather is free from dirt, so that the function is guaranteed.



While cleaning with high-pressure sprayer make sure no water can enter through the breather. Water could cause serious damage to the transmission.

5.2.2. Check oil level transfer case



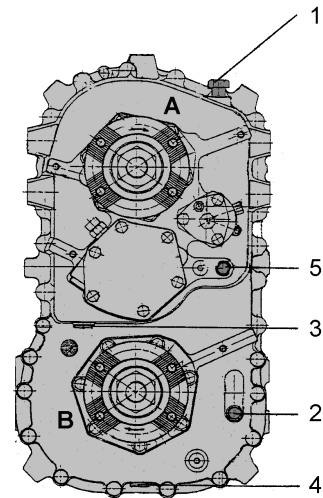
Check the transfer case oil level every two months under normal operating conditions.



To prevent measuring errors the oil level must not be checked immediately after operation. The oil temperature must be below 40°C.

Shaft (A) is the inlet shaft and shaft (B) is the outgoing shaft for the drive of driven axles 2 and 3. (Picture 5-7)

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



Picture 5-7

5.2.3. Change oil in transfer case



Under normal operating conditions change the oil every year during the annual maintenance.

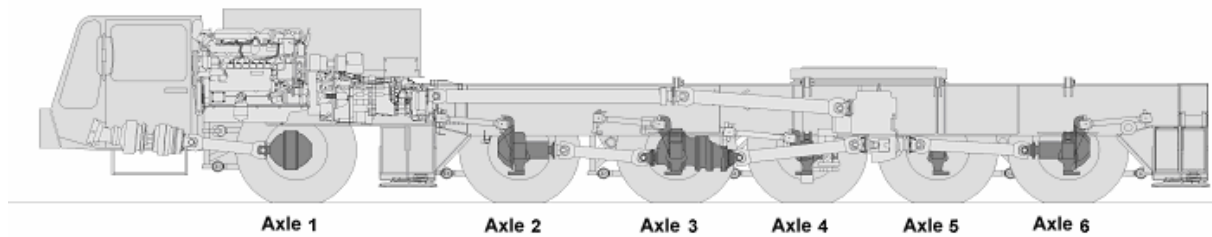


Caution!
The transfer case and oil are hot after a long drive.

1. Make sure the truck stands on level ground.
2. Put a trough under the drain points.
3. Unscrew the drain plugs (3 and 4) (Picture 5-7).
4. Clean the drain plugs and provide them with new seal rings.
5. Remount the plugs.
6. Remove the plugs from filling holes (2 and 5).
7. Fill approx. 6,5 ltrs fresh oil through the filling holes to the edge of the hole.
8. Remount the filler plugs with new seal rings.



5.3. Axles



Picture 5-8

All driven axles are Kessler & Co axles.

Axle number	Steered	Driven	Differential	Ratio Reduction	
Axle 1	Yes	Yes	Hydraulic	Single	6.38
Axle 2	Yes	Yes	Mechanical	Single	6.35
Axle 3	Yes	Yes	Mechanical	Feed-through	6.35
Axle 4	No	No	-	-	-
Axle 5	Yes	No	-	-	-
Axle 6	Yes	Yes	Mechanical	Single	6.35

5.3.1. General maintenance axles



Check the axle hubs and differential of axles 1, 2, 3 and 6 every to months for external leaks and make sure the breather is free from dirt to guarantee its function. Carry out this inspection for the differentials as well as for the axle hubs.



While cleaning with high-pressure cleaner make sure no water can enter through the breathers. Water could cause serious damage to the axles.

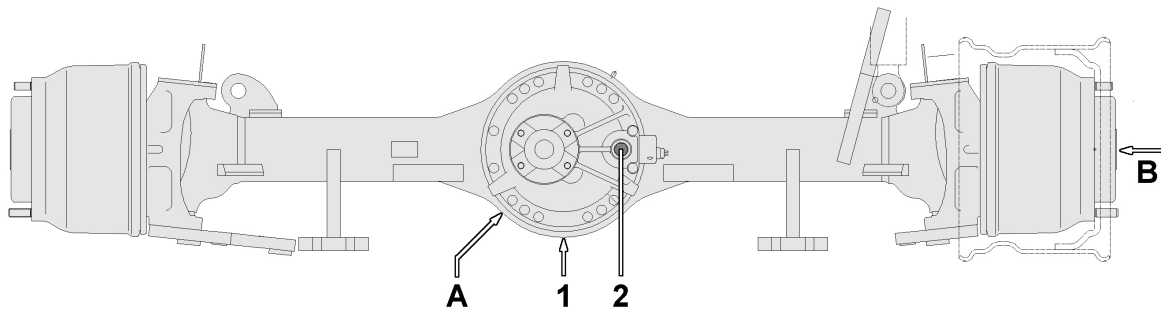
5.3.2. Check oil level differentials



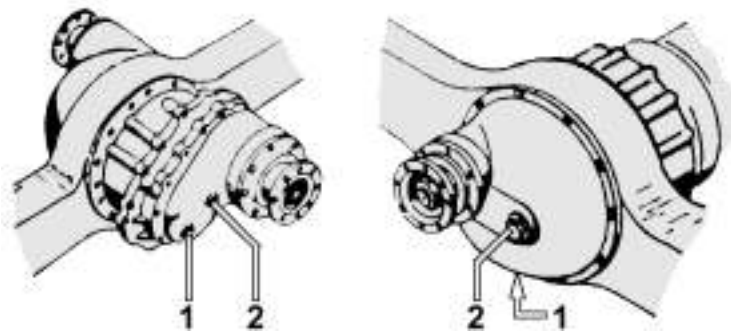
Check the differentials' oil level every two months under normal operating conditions.



To prevent measuring errors the oil level must not be checked immediately after operation. The oil temperature must be below 40°C.



Picture 5-9, model with single differential



Picture 5-10, 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 5-9 and Picture 5-10).
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. Oil change in differentials



Under normal operating conditions change the oil every year during the annual maintenance.



Caution!

The differentials and oil are hot after a long drive.

1. Make sure the truck stands on level ground.
2. Put a trough under the oil drain point.
3. Unscrew drain plug (1) (*Picture 5-9 and Picture 5-10*).
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 axle hubs



Check the axle hubs oil level every two months under normal operating conditions.



To prevent measuring errors the oil level must not be checked immediately after operation. The oil temperature must be below 40°C.

The axle hubs (B) of axles 1, 2, 3 and 6 are filled with oil (*Picture 5-9*).

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 5-11*).
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 eight axle hubs.



Picture 5-11

5.3.5. Change oil axle hubs



Under normal operating conditions change the oil every year during the annual maintenance.



Caution!

The axle hubs and oil are hot after a long drive.

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. Tyres

5.4.1. General maintenance tyres



Under normal operating conditions check the truck tyres and rims every week.

To guarantee a safe travel the tyres and rims must be checked regularly for wear and damage. Check the wheels' outside as well as inside. If necessary turn the steering wheel fully to the right or to the left to improve accessibility.

5.4.2. Tyre pressure



Check the tyre pressure every two months under normal operating conditions.

Make sure the tyre pressure in all tyres is **9 bar**.
If this is not the case correct the tyre pressure.



5.5. Check the brake linings



Check the brake linings during the annual maintenance under normal operating conditions.

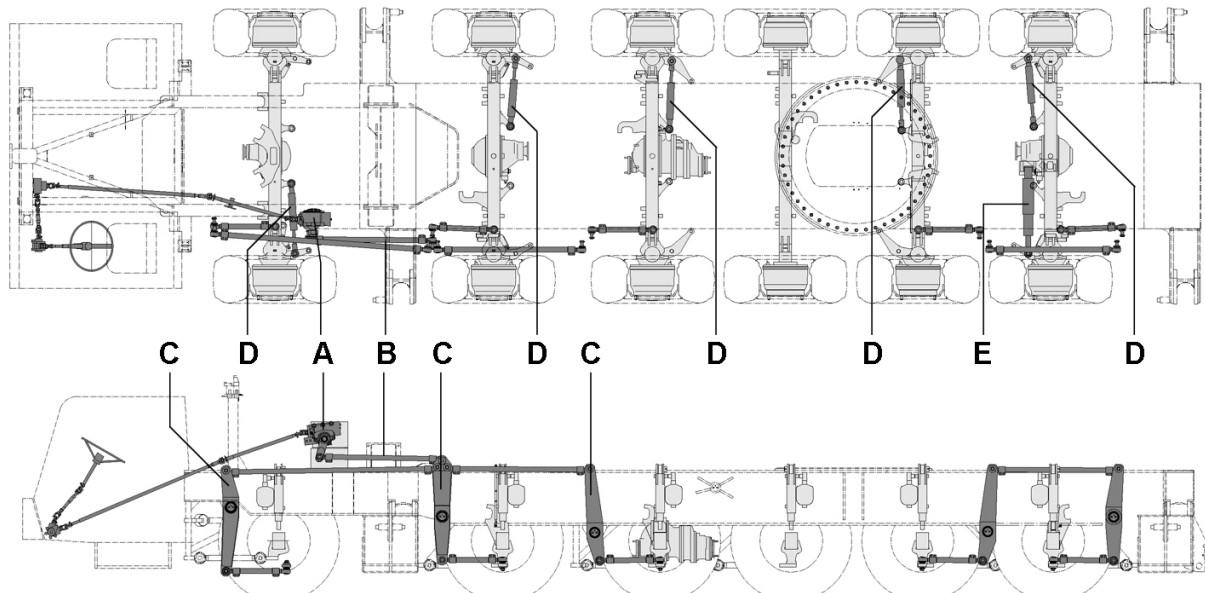
At the rear of every brake drum you can check if the brake lining has the required strength for safe operation. The brake lining must be replaced if it is worn to the wear ring, which you will find on the lining side.

5.5.1. Brakes

We recommend that you test the brakes at least once a year on a brake testing device.



6. Steering system



Picture 6-1

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

The AT6 steering system steers axles 1, 2, 3, 5 and 6, whereas axles 5 and 6 are steered in opposite direction, to create a smaller turning circle.

Picture 6-1 shows how the steering is constructed. The steering can be divided in two parts; the three front axles and the two rear axles.

In the steering gear housing (A) the turning motion of the steering wheel is mechanically converted and powered to the motion of the steering rods (B). These in their turn operate the steering arms (C) of axles 1, 2 and 3.

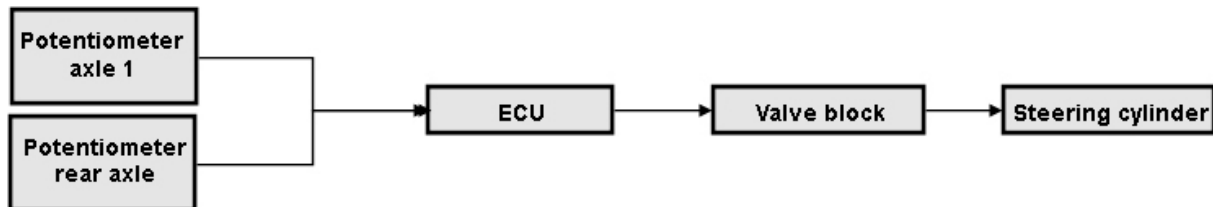
Axles 5 and 6 are not mechanically connected with axles 1, 2 and 3. These axles are steered hydraulically by means of a valve block and 3 steering cylinders.

For more information regarding the hydraulic part please refer to the hydraulic system.

6.1. Rear axle steering

6.1.1. Function of Rear Axle Steering

On axle 1 a sensor is mounted, that measures the steering travel. Also on the rear axle a sensor is mounted, that measures the steering travel. Both signals are sent to the steering's ECU (computer). The ECU controls the valve block of the rear axle steering. Depending on the travel speed, the rear axles are steered in a direction opposite axles 1 and 2. Schematically it looks as follows:



Picture 6-2

6.1.2. Rear axle steering malfunction

If the electronically controlled rear axle steering malfunctions, an emergency system sees to it, that the rear axles are steered in straight on position. The front axles remain steerable as usual.

On the display in the truck cab there will appear an error message. The error codes are to be found in the enclosures.

6.2. Checking the steering system



Check for play in the steering arms and –balls, steering housing (bolts) and steering rods every two months.

This check should be carried out by 2 persons. Put the crane in transport mode. While one person turns the steering wheel somewhat to the left and to the right, the other person checks if there is not too much play in the steering arms and balls, steering housing (bolts) and steering rods.

6.3. Align



To prevent excessive tyre wear the truck must be aligned every year.

Before the crane is aligned, the play in steering arms and steering rods must be checked. As the crane is fitted with an electronic rear axle steering, we recommend that you contact Spierings Kranen before you start the alignment.



7. Electrical system

The on-board power on the truck is 24V, provided by two 12V/165Ah batteries series connected. During operation these batteries are charged by a 24V dynamo with a maximum charging current of 35A.

With the battery switch in the truck cab the truck's electrical system can be cut off. Use this switch in case of welding on the crane or when the crane is parked for a longer period of time.

At the co-driver's side a print with fuses and relays is situated in the control board.



Picture 7-1

Under the middle console another number of electrical components are mounted. They are accessible through a lid at co-driver's side. (See chapter 2, middle console)

7.1. Lighting



Check the truck lighting every day before driving off and during the annual maintenance.

If a bulb does not or barely burns or if it burns too brightly, it must be replaced as soon as possible, in order to secure optimal safety.

You will find a summary of all lamps in Chapter 11, Technical Data.

7.2. Dashboard Lighting



Check the dashboard lighting every day before driving off and during the annual inspection.

Check the dashboard lighting for defective bulbs daily. Replace defective bulbs as soon as possible to prevent severe damage to the vehicle.



7.3. Batteries

7.3.1. Check batteries



Check the truck batteries every two months.



CAUTION!

Battery acid is harmful to your health and the environment. Handle it with care!

Check the batteries on the following points:

- Is the fluid level still acceptable (if necessary, top up with distilled water)?
- Is there no cable damage?
- Are the battery terminals properly tightened?
- Are the batteries themselves properly mounted?
- Do the batteries have to be charged?

7.3.2. Charging 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 charger and respective cable to charge the batteries. If you use a quick charger all battery cables must be dismantled to prevent damage to electronic components. In case of a normal charger, this is not necessary.

1. Make sure the engine is not running. (Remove the key from the ignition).
2. Remove the left-hand engine cowling.
3. Connect the cable with NATO-connection to the truck connection and charger.
4. Switch on the charger.
5. After the charging is finished, you have to switch off the charger first.
6. Remove the cable.
7. Remount the engine cowling.
8. Start the engine and leave it running for a couple of minutes.



Picture 7-2



7.3.3. Batteries replacement

If the engine has trouble starting (with charged batteries) it is advisable to replace the batteries. Replace the batteries always by batteries of the same type and measurements.

1. Make sure the engine is not running. (Remove the key from the ignition).
2. Put the tower in upright position.
3. Remove the left-hand engine cowling (1). (*Picture 7-3*)
4. Unscrew nut (2) and remove the cover.
5. Always first loosen the battery minus terminals and then the plus terminals.
6. Remove the battery holder.
7. Remove the old batteries from the battery holder and mount new ones.
8. Fix the new batteries with the battery holder.
9. First connect the plus terminals and then the minus terminals. (Make sure they are properly fixed).
10. Properly grease the battery poles with Vaseline.
11. Mount the battery holder cover and fix it with a nut.
12. Remount the engine cowling.
13. Start the engine and leave it running for a couple of minutes.



Picture 7-3

8. Hydraulic system

8.1. Check the oil level in the hydraulic oil tank

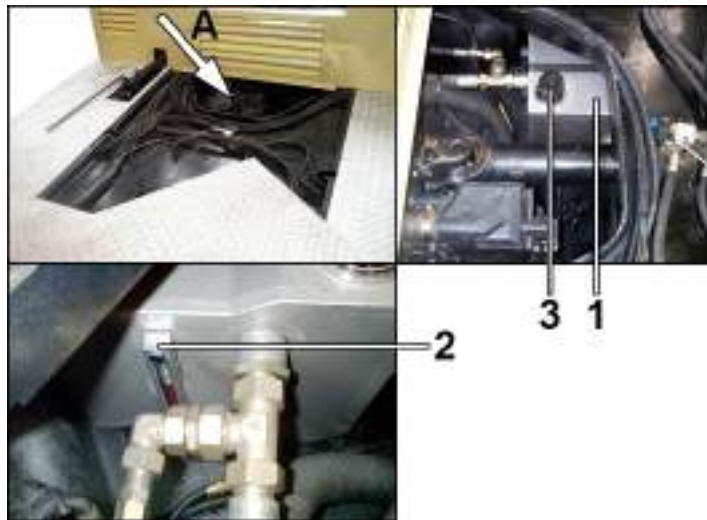


Check the hydraulic oil level every two months under normal operating conditions.



To prevent measuring errors the oil level must not be checked immediately after operation. The oil temperature must be below 40°C.

1. Make sure the truck stands on level ground.
2. Put the tower in upright position.
3. Remove the cover plate (A) in the middle directly behind the truck cab (*Picture 8-1*).
4. Check on the gauge glass (2) at the front of oil tank (1) if the oil level is at approx. 80% of the gauge glass.
5. If necessary top up hydraulic oil through the filling hole (3) in the oil tank.
6. Always top up hydraulic oil of the same brand and type. (In doubt please always consult Spierings Cranes.)



Picture 8-1

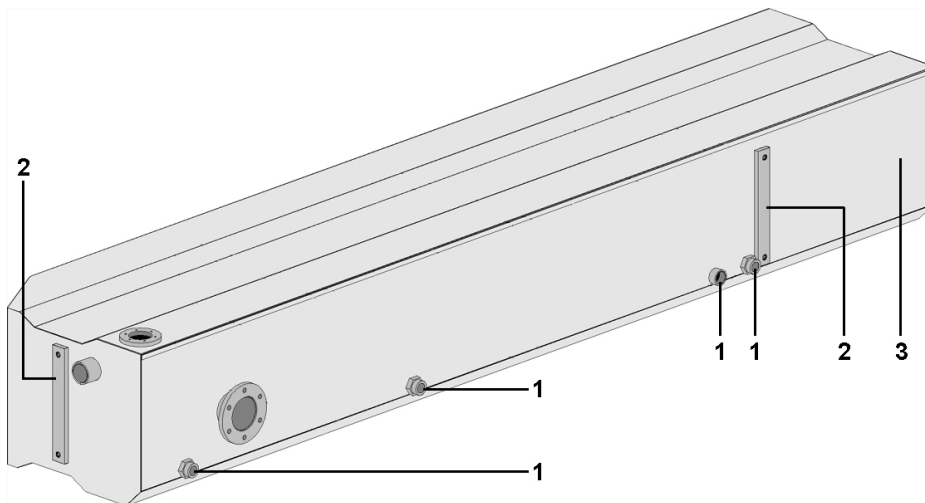
8.2. Changing hydraulic oil



Change the hydraulic oil every 5 years after oil analysis.

Before changing the oil first an oil sample is analysed. If it is necessary to change the oil, all hydraulic cylinders must be retracted, including the suspension cylinders.

1. Remove the filler cap (3) from oil tank (1) (*Picture 8-1*).
2. Put a trough under the drain points (1) (*Picture 8-2*).



Picture 8-2

3. Unscrew the drain plugs and drain the oil from all four compartments of oil tank (3).
4. Fit all plugs with new seal rings and reinstall them.
5. Fill the tank through the filling hole with 550 ltrs hydraulic oil according to the specification in Chapter 11, until it is approx. 80% full. (You can check this on two gauge glasses (2)).

8.3. Replace hydraulic oil filter



Replace the hydraulic oil filters during the annual maintenance under normal operating conditions.

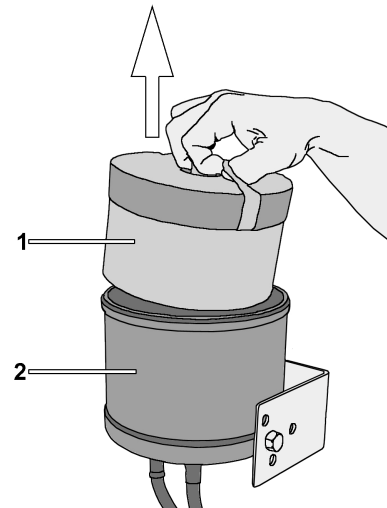
8.3.1. Hydraulic fine filter



Picture 8-3

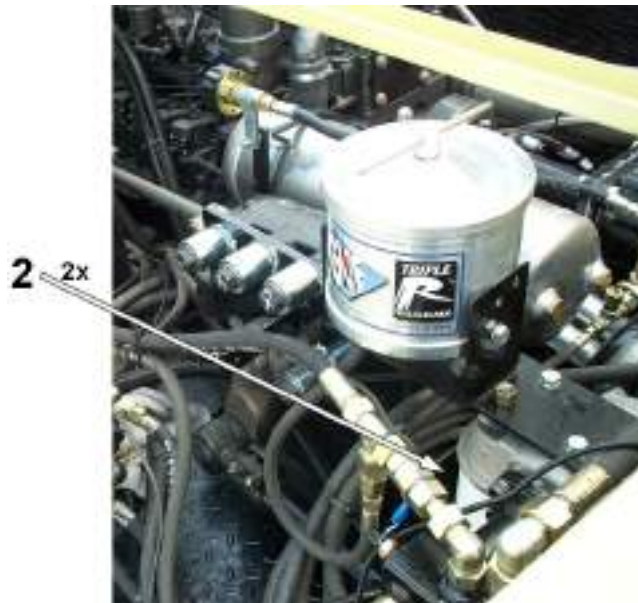
The hydraulic fine filter (1) is located under the left-hand engine cowling (Picture 8-3) To reach it, the upper plate must be removed after the tower has been put in upright position.

1. Unscrew the filter holder lid by turning the levers to the left.
2. Remove the fine filter (1) from the holder (2) and replace it by a new one (Picture 8-4)
3. Manually tighten the filter holder lid as firmly as you can.
4. Leave the engine running a couple of minutes.
5. Check the oil level on the gauge glass and top up oil if necessary.
6. Check for leaks.
7. Reinstall the cover plates.



Picture 8-4

8.3.2. Hydraulic filters



Picture 8-5

The return filters also are located under the left-hand engine cowling, under the fine filter (Picture 8-5). Remove the left upper cover plate and the middle cover plate after the tower has been put in upright position.

1. Unscrew the filters by means of a filter wrench.
2. Lightly grease the seal rings of the new filters with oil before reinstalling them.
3. Manually tighten the filters.
4. Leave the engine running a couple of minutes.
5. Check the oil level on the gauge glass and top up oil if necessary.
6. Check for possible leaks.
7. Reinstall all cover plates.

8.4. Check the suspension accumulators



Under normal operating conditions check de suspension accumulators every year.

The AT6 suspension has 12 accumulators. They are all mounted on the hydraulic suspension cylinders on each axle. To check the accumulators you need special tools from HYDAC. The pressure must be 110 bar.



8.5. Hoses and couplings hydraulic system



Check all components of the hydraulic system for leaks and damage every two months.

All hoses, couplings, hydraulic blocks, filters, cylinders and the oil tank have to be checked regularly for damage and leaks. Replace defective parts as soon as possible to prevent severe damage.



9. Pneumatic system

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

The primary system for the truck brakes exists of 3 circuits.

The secondary system for the accessories exists of 2 circuits.

The air pressure is supplied by a compressor mounted on the engine.

Furthermore, the system is secured by a 4-circuit safety valve. If there is a leak in one of the circuits, this valve sees to it that the other circuits keep their pressure.

9.1. Primary system: brake system

The brake system works on the basis of relay valves operated by control air. This means that from the foot pedal or from the parking brake valve through the air line, a signal (control air) is sent to the various relay valves. Air lines with feeding pressure are connected to these relay valves. When the valves are operated by the control air, the feeding pressure will be sent to the brake boosters, so that the truck's brakes are powered.

The brake system has 4 air vessels;

- Vessel 1 (60 ltrs)
This vessel supplies the powering of the (operating)brake boosters of axles 3 to 6 at the right-hand side.
- Vessel 2 (60 ltrs)
This vessel supplies the powering of the (operating)brake boosters of axles 3 to 6 at the left-hand side.
Furthermore, through the brake pedal this vessel supplies the control air for operating the relay valves for the (operating) brake boosters of axles 3 to 6.
- Vessel 3 (60 ltrs)
This vessel supplies the powering of the (operating)brake boosters of axles 1 and 2.
Furthermore, through the brake pedal this vessel supplies the control air for operating the relay valves for the (operating) brake boosters of axles 1 and 2.
- Vessel 4 (40 ltrs)
This vessel supplies the powering of the parking brake boosters of axles 3 to 5.
Furthermore, through the parking brake pedal this vessel supplies the control air for operating the relay valve for the parking brake boosters of axles 3 to 5.

The parking brake operates on the basis of de-aeration. As soon as the brake lever is operated, the parking brake boosters on axles 2, 3 and 4 are bled, engaging the brakes.

9.2. Secondary system: accessories and transmission

For the pneumatically controlled components of the drive system there is a separate circuit.

This circuit has its own 10 ltrs vessel. To prolong the service life of the secondary air circuit's valves a pressure reducing valve with water separator and oil atomizer is installed directly after the air vessel.

The pressure reducing valve of the secondary circuit is adjusted at 8 bar.

The secondary system exists of two vessels;

- Vessel 5 (10 ltrs)
This vessel supplies the air pressure for all secondary components (accessories).
- Vessel 6 (20 ltrs)
This is in fact an emergency vessel for the clutch. If the air pressure in the secondary system was to be cut off, you could still operate some gear shifts.



The components supplied by the secondary air circuit are:

- Transmission: - Feeding various transmission functions
- Vacuum brake: - Close off the exhaust valve
- Cut off the fuel pump
- Transfer case: - Shifting road travel/all-terrain gear
- Operating longitudinal differential lock
- Axles: - Operating transverse differential lock axles 2, 3 and 6
- Operating longitudinal lock axle 3
- Operating front axle drive

9.3. Air dryer

To prolong the service life of components and guarantee the proper functioning the pneumatic system is fitted with an air dryer.

9.3.1. Air dryer filter replacement



Replace the air dryer filter every two years under normal operating conditions.

The air dryer is situated at the right next to the pumps behind the diesel engine air inlet (2) (Picture 9-1).

- Make sure the tower is in upright position and the engine is switched off.
- Remove the centre cover plate of the engine cowling.
- Loosen the filter element (1) of the air dryer with a filter wrench.
- Sparingly oil the new filter element seal ring with oil.
- Mount the new filter element on the filter holder and tighten it manually.
- Start the engine and check for leaks.
- Reinstall the cover plate.



Picture 9-1

9.4. Air vessels



Check the air vessels for the presence of condensation every week.

Check the air vessels for condensation by pulling or pressing the drain valve ring under the air vessels. In case of regular condensation drained from the vessel the air dryer element must be replaced (see 9.3.1 Air dryer filter replacement).



Picture 9-2

9.5. Oil atomizer/water separator



Under normal operating conditions, check the oil atomizer level and drain the water separator every 2 months.

The water separator/oil atomizer is situated between axle 3 and 4 at the right-hand side of the truck.

The water separator/oil atomizer is shown in *Picture 9-3* and exists of the following parts:

1. Pressure reducing valve
2. Water separator
3. Valve water separator
4. Set screw oil atomizer
5. Oil atomizer



Picture 9-3



9.5.1. Replenish oil atomizer

1. Make sure the diesel engine is not running.
2. Loosen bottom piece (5) from the holder and fill it with oil.
3. Reinstall the bottom piece with oil in the holder.
4. If necessary adjust the amount of atomised oil by means of set screw (4).

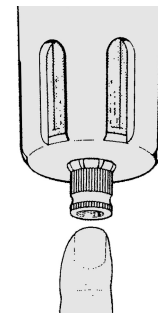
9.5.2. Water separator

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.

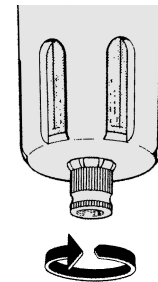
When there is no pressure on the air system, the valve at the bottom of the water separator opens and drains the water of condensation.

Manually press the valve upwards to drain the water of condensation.
(Picture 9-4)



Picture 9-4

To close the valve permanently, turn the valve to the right.
(Picture 9-5)



Picture 9-5

To clean or replace the filter element, unscrew the bolt of the filter element using a special tool. (Picture 9-6)



Picture 9-6

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 pressure of all axles during the annual maintenance.

On the brake boosters of all axles gauge connections are mounted, to which an approved pressure gauge must be connected. Let the diesel engine run and operate the operating brake with the pedal in the truck cab. Subsequently check the following pressures.

- Pressure of brake boosters axle 1: 9.0 bar
- Pressure of brake boosters axle 2: 8.5 bar.
- Pressure of brake boosters axle 3 and 4: 4.0 bar
- Pressure of brake boosters axle 5 and 6: 5.5 bar

The pressures can be set by means of two pressure reducing valves mounted in the control lines.

Also check the system pressure by connecting the pressure gauge to one of the 60 ltrs vessels mounted between axle 3 and 4. The system pressure should be 9.8 bar. The system pressure can be set through the pressure relief valve on the air dryer.

9.7. Hoses and couplings pneumatic system



Check all components of the pneumatic system for leaks and damage every two months.

All hoses, couplings, pneumatic valve blocks, filters, cylinders and air vessels have to be checked regularly for damage and leaks. Replace defective parts as soon as possible to prevent severe damage.

10. Lubrication

10.1. Central lubricating system



The central lubricating system has to be checked every 2 months to make sure all points are provided with grease and the grease reservoir is sufficiently filled with grease.

Connections, hinges and bearings are points that should be greased regularly. Some points even so regularly, that a central lubricating system brings help. However, also these points must be checked at regular intervals. If a point is not or insufficiently greased, it could result in damage.

10.1.1. Time switch central lubricating system

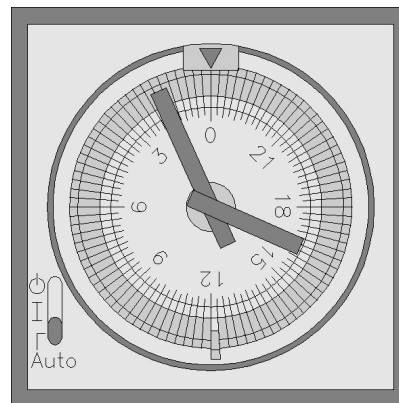
The central lubricating system is controlled by a time switch, with which the lubricating time in relation to the travel time can be set (see *Picture 10-1*).

The time switch must be set in such a way that for every 24 hours of travel, there is a lubricating time of 15 minutes. To this end one slide of the time switch must be extended.

For automatic lubrication the time switch must always be set to "Auto" or "A".

If additional lubrication is required, you can set the switch in position "I". The grease pump will be activated instantly. Do not forget to return the time switch to automatic after ± 15 min.

The central lubricating system time switch is situated in the middle console at co-driver's side.



Picture 10-1

10.1.2. Grease reservoir central lubricating system

The grease pump with grease reservoir of the central lubricating system is situated under the left engine cowling (see *Picture 10-2*).

To check and fill the grease reservoir the left cover plate of the engine cowling must be removed.

The grease in the reservoir must be above the "Min"-level (A). Use grease nipple (B) to refill grease.

Use grease according to the specifications as stated in Chapter "Technical Data".

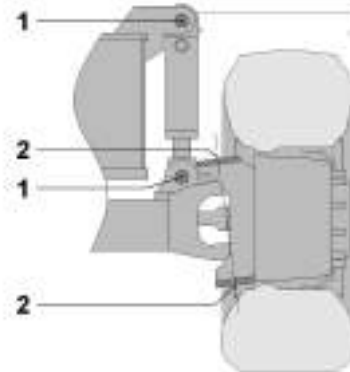


Picture 10-2

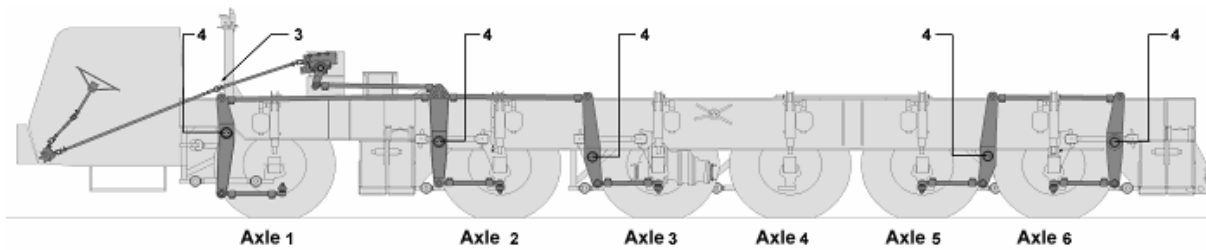


10.1.3. Grease Points Central Lubricating System

1. Pins upper and lower suspension cylinders connection.
2. Upper and lower steering knuckles (except on axle 4)



Picture 10-3



Picture 10-4

3. Suspension bearing steering rod
4. Steering arms hinge points



10.2. Manual lubrication



The lubrication interval for points that need manual lubrication is 2 months.

For manual lubrication you need a grease gun or a brush. For all points we recommend EP2 grease.

10.2.1. Extension cylinders outrigger beams

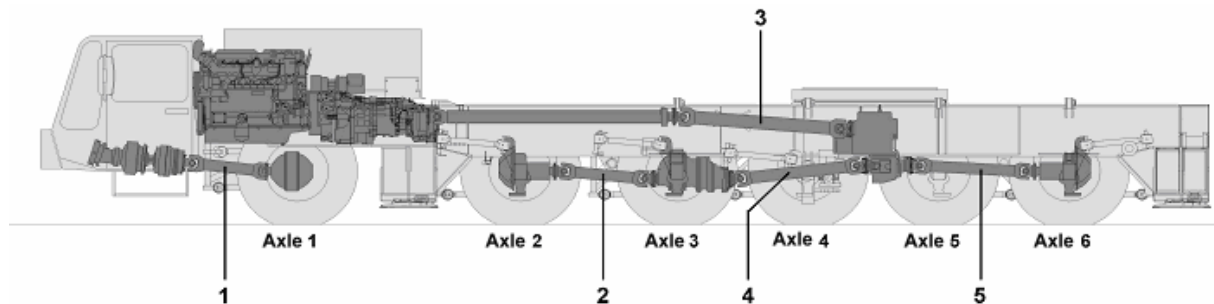
Picture 10-5 shows where the grease nipple of the extension cylinder is situated in the outrigger beam (A).

To grease these nipples the outrigger beams must be extended so far, that the holes stick out from the frame. Through these holes, the grease nipples (1 each outrigger beam) are accessible.



Picture 10-5

10.2.2. Cardan shafts



Picture 10-6

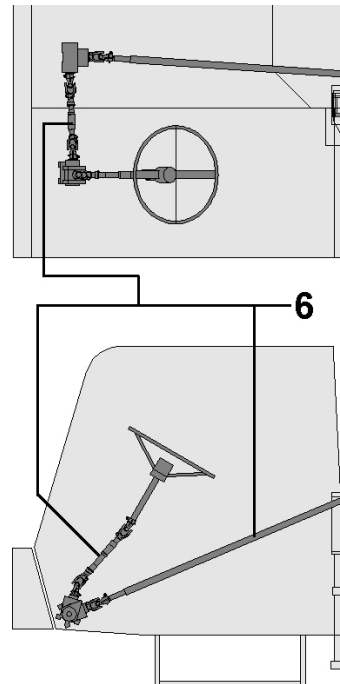
1. Universal joints cardan shaft hydraulic drive axle 1.
2. Universal joints cardan shaft axle 2.
3. Universal joints cardan shaft transmission.
4. Universal joints cardan shaft axle 3.
5. Universal joints cardan shaft axle 6.



10.2.3. Steering system

The various steering rod ball couplings are maintenance-free, except the spline bushes. These must be lubricated manually.

Next to lubricating the spline bushes also make sure all couplings and connections on the steering system do not show any play.



Picture 10-7

10.2.1. Tower supports

The tower supports are located behind the cabin on top of the motor cowling. (See Picture 10-8)
Grease the supports with EP2 by means of a brush.



Picture 10-8



11. Miscellaneous

11.1. Check windscreen washer fluid



Check the windscreen washer fluid level every week.

11.2. Fire extinguisher



Have the fire extinguisher checked by a certified authority every year.

11.3. Air-conditioning (Option)

The air-conditioning contains coolant under high pressure. Do not remove any parts from the air-conditioner.



All duty to the air-conditioning system can only be executed by qualified personnel.



Repair the air-conditioning as soon as possible when it does not function anymore to prevent further damage. Contact Spierings Kranen when in doubt.



12. Technical data

Diesel engine		Spierings nr.
Engine oil	SAE 15W40 ACEA E4-98	-
Oil filter	DAF nr. 1397765	SERV01150065
Centrifugal filter	DAF nr. 1376481	SERV01150066
V-belt water pump-, fan- and dynamo drive 2x	DAF Nr. 1393365	-
V-belt tension device single belt	Kriket I (DAF Nr. 1240442)	-
V-belt tension device Twin-belt	Kriket II (DAF Nr. 1240443)	-
Coolant	SAE-J-1034 of ASTM D 3306 (COOLELF PLUS 37°C)	OLSM00100080
Air filter	DONALDSON P77-7868	SERV03100170
	DONALDSON P77-7869	SERV03100180
Water separator	DAF nr. 1296851	SERV04300010
Fuel filter	DAF nr. 1450184	SERV01150085
Nozzle tools	DAF Nr. 1329309 en 0694928	-
Gear box		
Oil gear box (original at delivery)	BP ENERGYEAR SHX 30 SAE 75W85	-
Oil gear box (At maintenance by Spierings)		
Transfere case		
Oil transfer case (original at delivery)	ELF: TRANSELF SYNTHESSE FE 75W90	OLSM00100120
Oil transfer case (At maintenance by Spierings)	ELF: TRANSELF SYNTHESSE FE 75W90	OLSM00100120
Sealant ring oil drain plug	O-ring-A22x27-Cu DIN 07603	
Axles/brakes/tyres		
Oil axles at delivery	ELF: TRANSELF SYNTHESSE FE 75W90	OLSM00100120
Oil axles (at maintenance by Spierings)	ELF: TRANSELF SYNTHESSE FE 75W90	OLSM00100120
Brake-shoe truck	-	-
Tyres	445/75 R22.5	-
Tyre pressure	9 bar	
Rim	22,5" x 14"	AACA01100030
Hydraulics		
Hydraulic oil	ATF Dexron-IID, -IIE, -III of Mercon-M (oa. ELF Elfmatic G3 22051)	OLSM00100040
Fine filter	GVF-Triple R	HYIN04100040
Oil filter (2x)	CS-15AN	HYN04100211
Pneumatics		
Dryer element	Wabco 432 410 2227	SERV05100010
Miscellaneous		
Grease (general)	EP2 (oa. AVIA Mystiek JT-6)	OLSM01500030
Grease central lubrication system	EP2 (oa. AVIA Mystiek JT-6)	
Oil atomizer/water separator	ISO/UNI FD22 (oa. Berulit 75)	OLSM00400010



13. Enclosures

Enclosure 1	General
Enclosure 2	Table of content
Enclosure 3	General overviews
Enclosure 4	Electrical plans
Enclosure 5	Hydraulic and pneumatic plan
Enclosure 6	Overviews